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FRUIT INDUSTRY OF VICTORIA.

The Present Status and Future Outlook from a Commercial Stand-point.

By E. Meeking, Senior Fruit Inspector.

PART I.

Introductory Effects of the War.

Since the last articles under this title appeared in this journal for October, 1914, the fruit industry, in common with all other industries, has passed through the ordeal of the world war, and the abnormal conditions created thereby both during the period of hostilities and since the signing of the armistice; in fact, the industry has been so profoundly affected that its present position and future outlook have undergone very material alteration.

For the first year of the war the export of fresh, dried, and canned fruits was completely cut off, and it seemed that the export section of the industry would be temporarily extinguished. By arrangement, however, with the Navy Department in 1916, the trade was resumed, and owing to the increase in the purchasing power of the British public, record prices were obtained, and the quantity shipped was greater than in any previous season. Large army contracts were also placed with the Imperial, Indian, and American Governments, for jams and canned fruits, which resulted in an abnormal and unprecedented expansion in the export trade of these commodities. As a consequence of these circumstances, the fruit industry until the end of 1919 was in a better position than it had ever been, and growers and others concerned wer receiving higher and more remunerative returns.

By 1920, however, practically the whole of the allied armies disbanded, unemployment was making itself manifest in the Kingdom, and the purchasing power of the public in all the

d elsewhere had declined to below the
which Victorian exporters had built up
ly ceased, and no compensating outlet,
dom or any other European country, could
sts in Victoria were at the same time much
, and up to the present have shown little, if any,
he purchasing power of the Australian public has
ected by the war, or the resultant conditions, little
ustry has been obtained from this fact, as under our
of distribution and marketing very little increase in
on has been possible.

try, therefore, is faced at present with the following

, Production costs much in excess of pre-war level;
) A curtailment of the export trade in fresh and canned fruits and jams; and
(*c*) Increasing production in most sections of the industry.

In 1911 the consumption and distribution of fruit in Victoria was given as follows:—

	Per cent.
Export to other States ..	13.5
Oversea export .. .	8.8
Manufactured into jams, canned fruits, &c. .	27.3
Converted into dried fruits	1.09
Local consumption	49.0

These percentages were from a total of 3,583,059 bushels of large fruits, and 58,918 bushels of small fruit, a total of 3,641,977 bushels, exclusive of grapes.

In addition to the above, 785,106 bushels were imported from other States, and 81,560 bushels were imported from oversea, giving altogether an equivalent of 2,648,879 bushels of fruit consumed in Victoria. These figures were quoted in this journal for November, 1912. They then worked out on the population basis at a consumption of three and a half ounces of fruit per day per individual. Since these figures were given the position has not materially altered.

In 1921 the percentages were as follow:—

	Per cent.
Export to other States . .	13.65
Oversea export	4.7
Manufactured into jams, canned fruits, &c. .	23.7
Converted into dried fruits	2.21
Local consumption (as fresh fruit)	55.73

These percentages were from a total of 3,999,599 bushels raised. To obtain the consumption 1,429,316 bushels imported from other States, and 65,800 bushels imported from oversea should be added, and 734,097 bushels exported to oversea countries and other States deducted, which will give a total of 4,760,618 bushels consumed in Victoria for 1921, or an approximate average daily consumption of uit in all forms of five ounces of fruit per day per head of population.

he canning and jam making section of the trade is that which has most materially affected by the war and after conditions, and the of canned fruits, particularly the growers of canning varieties of

peaches, are faced with the prospect
with no corresponding outlet for the dis,
The position has been relieved in 192
ment of Commonwealth fruit pools, which
under advances from the Commonwealth G
the business. As another pool will probably
season the growers of canning peaches will be tide
for at least another season. There is very little
pools not been formed the peach crop could not hav
at profitable prices, as the private facilities for process
ing the whole of the present production would have be
quate for this purpose. This relief, however, is only temp

With the resumption of trading facilities throughout
the competition on the oversea markets in fresh, dried, and cann
has become very keen. The fruit industry of Australia is th
faced with the position of high local production costs and keen ou
market competition. To keep the industry going two methods
possible—(*a*) increased local consumption of fruit within Australia and (*b*) the expansion of oversea markets. The only means by which either or both of these may be brought about are by cutting costs of production to a minimum, the improvement in present system of distribution and marketing, and the introduction of standardized methods of preparing fresh, dried, and canned fruits for market.

Subsequent articles will endeavour to point out the present disabilities in these matters, and also the means by which they may be removed.

(*To be continued.*)

"PERSIAN LAMB."

Dr. Omer H. Patrick, who can claim to be the only breeder of Karakul sheep in the British Empire, gave some interesting details of the Persian lamb industry. He said that what is known as Persian lamb fur is really derived from the pelts of the young of the Karakul sheep, which are natives of Bokhara in Russian Turkestan. Dr. Patrick is a pioneer in breeding these valuable animals in Canada, and on his ranch near Calgary, Alberta, he maintains a flock of a thousand head, some pure Karakul and some crossbred with British domestic sheep.

"This new industry has been in existence over eight years," Dr. Patrick stated in an interview. "In 1913 I was asked to take over a few Karakul sheep, imported from Bokhara, which had not taken kindly to Eastern Canada. The animals have thrived in Alberta, and are strong opponents of 'race suicide.' My experiments in cross-breeding have proved thoroughly satisfactory, and, in addition to disposing of the pelts and meat, I am now selling live animals to other farmer
I believe there is a big future for Karakul breeding in Western Canad

As illustrating the value of this fur it may be stated that the
of Persian lamb fur worn by Mrs. Harding, wife of the Presi
the United States, in the past winter cost nearly £6,000.—*New
Farmers' Advocate*, Nov., 1922.

ULTURE IN VICTORIA.

ed from page 768, vol. xx.)

Farrell, Orchard Supervisor.

IV.—Preparation of Land.

ike most other fruits, both large and small, thrives
soil than on land previously cultivated, and especially
have been grown for lengthy periods, and most of the
ations are being established on new land. When the prelimi-
nals— locality, climate, and soil— have received consideration,
selected for the plantation should be cleared of all native timber
roots of same carefully removed to a depth of 18 inches to obviate
ossibility of native pests and diseases attacking the vines. The removal
he roots also facilitates deep cultivation in preparing the land for planting. When the grubbing is finished, the plane of the site may be graded to remove surface inequalities, and crab-holes should be located and filled in. Then, if not subsoiled, the land should be ploughed to a depth of from 10 to 12 inches, according to the depth of the surface soil. During winter is the best time for grubbing; grading and ploughing may be done afterwards, as soon as the land is in a fit state. Cultivation should then be continued during the following summer and autumn to get the land into a mellow, sweet condition to receive the young vines in the following September or October, when the frosts are over.

When it is intended to utilize previously-cultivated land, this should be ploughed, and, if necessary, graded and brought into a fine state of cultivation prior to planting. In grading the red friable soils, primitive locally-made wooden implements are used to do the work of buck-scrapers and slickers.

The passion vine has a great aversion to sour soil conditions, and particularly if these are created by stagnant water. In preparing the land, therefore, this aspect should be considered, but the subsoil of the red land is almost invariably of a porous nature, offering free natural drainage. Where these favorable conditions are non-existent, however, sub-drainage should be provided While good natural drainage is desirable, it should be remembered that the great fault with the red soil is that, in some places, its subsoil is too porous, and consequently in hot weather, and when water is not available, growers are obliged to resort to extra-intensive cultivation to maintain sufficient soil moisture for their vines.

V.—Planting Out and Erecting the Trellises.

The soil having been brought into a fit state of tilth to receive the
oung vines, pegs are used to mark the exact positions in which they
to be planted. Formerly a great diversity of opinion existed among
ers as to the most suitable distances apart to plant. Some adopted
9 ft., 10 ft. x 10 ft., 10 ft. x 12 ft.; others 10 ft. x 14 ft.,
14 ft , 12 ft. x 16 ft., &c. It is now generally recognized,
hat the most suitable distances apart are 12 ft. x 18 ft.—that

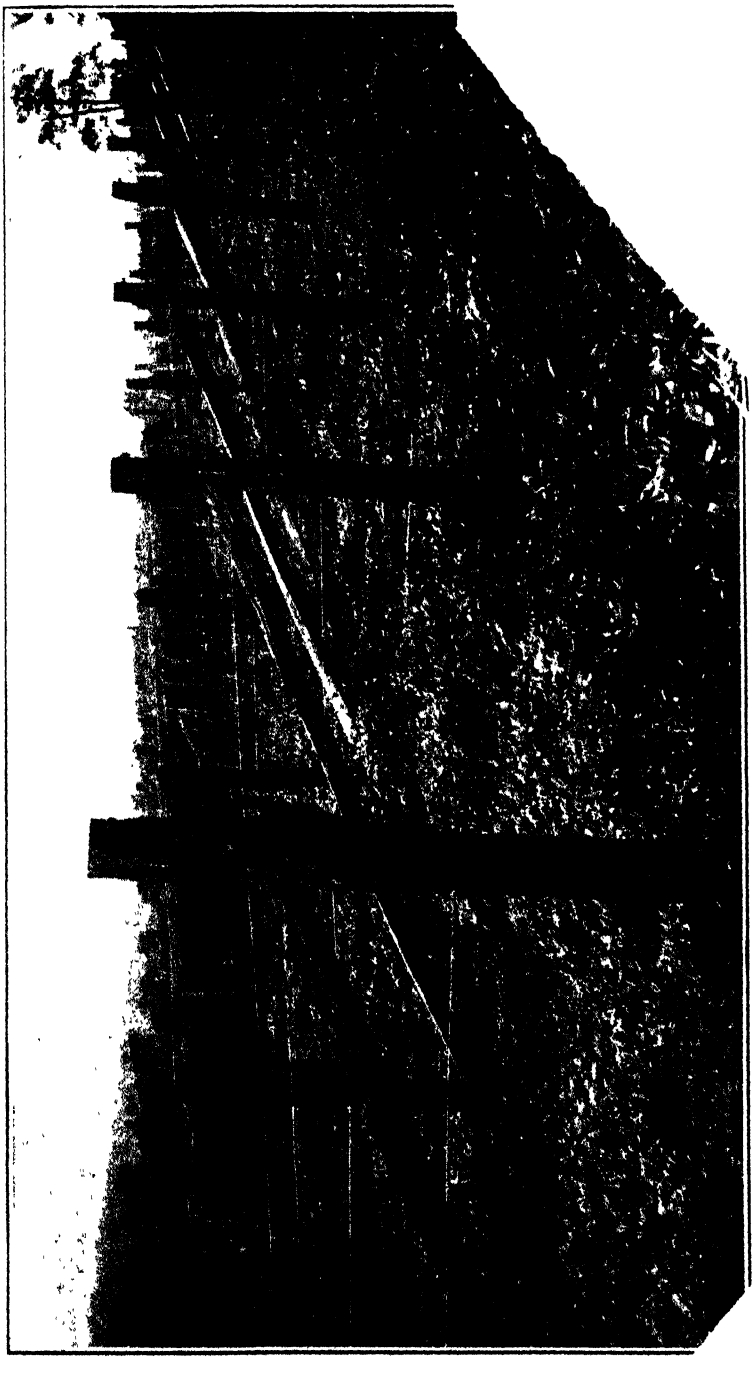

Fig. 4.—Mr. W. Bowman's Trellises at Silvan

d 18 ft. between the vines in the rows.
rows admit sufficient light and air to the
ultivation; while the 18 ft. spaces between
ford natural expansion of the fan-shaped
made to assume when being tide up on the
ands are usually 20 ft. wide, this being sufficient
lying, &c., while those at the side are only 12 ft.,
, being precluded by the wire trellises which run

he trellises are erected before planting the vines. This
cing the first or corner post of the block 20 ft. from
d 12 ft. from the side fence. The remainder of the first
sts are placed in a straight line at the distance stated from
fence, and 18 ft. apart to the other end, where another 20 ft.
d is provided. The second row of posts is placed similarly 12 ft.
the first, and so on, until all those necessary for trellising the
k are in position. The posts are almost invariably made of rough
split timber 6 in. x 6 in., 7 ft. to 8 ft. long, from 2 ft. to 3 ft. being
placed in the ground, leaving about 5 ft. above the soil level. Three to five 8 to 10-gauge wires are employed to support the vines, the weight of which, with the tight condition of the wires, exercise a considerable strain on the end posts.

To keep these rigid, however, they are supported by stays as shown in Figure 4, which illustrates a section of the trellises recently erected by Mr. W. Bowman on his passion block at Silvan. In setting out the young vines one is planted midway between each two posts in the trellis, and exactly beneath the wires. Thus the vines will also be 18 ft. apart, and have a space of 9 ft. on each side of the stem for fan expansion.

The methods of constructing trellises vary, and mostly according to the experience of growers, and many types are employed in the different districts. The writer having considered this matter from every aspect, would recommend one of the following dimensions:—Trellis, 6 ft. high, end posts 8 in. x 8 in., with 3 ft. 6 in. in the ground, and "stayed"; others 6 in. x 6 in., and 2 ft. 6 in. in the ground; five 10-gauge galvanized iron wires, 18 ft. between the posts, and the trellises 12 ft. apart.

To find and peg-out the exact positions which the vines are to occupy when planting is done before the trellises are erected, the following method may be observed:—Place the first or corner peg 29 ft. from the end and 12 ft. from the side fence; then complete the first row by placing the pegs 18 ft. apart, as explained in connexion with the erection of the posts. Then the pegging-out of the plot may be completed by putting in parallel rows of pegs 12 ft. from each other. Where there are no fences, or where those on the land do not describe a right angle to serve as a guide in planting, a right angle may be
set out by adopting the 3, 4 and 5 principle so often illustrated and
plained in articles in the *Journal of Agriculture* by the orchard
erts of the Department.

anting-out is usually done between the end of September and the
g of November, according to the conditions prevailing in the
localities, and when the frosts are over. The holes should not
eper than the soil has been cultivated, for the obvious

reason that basins formed in the subsoil may collect and retain surplus water, which is injurious to the plants. In planting the vines should be placed at the same depth as they grew in the nursery, and at this time the advantages of the planter having raised his own vines will

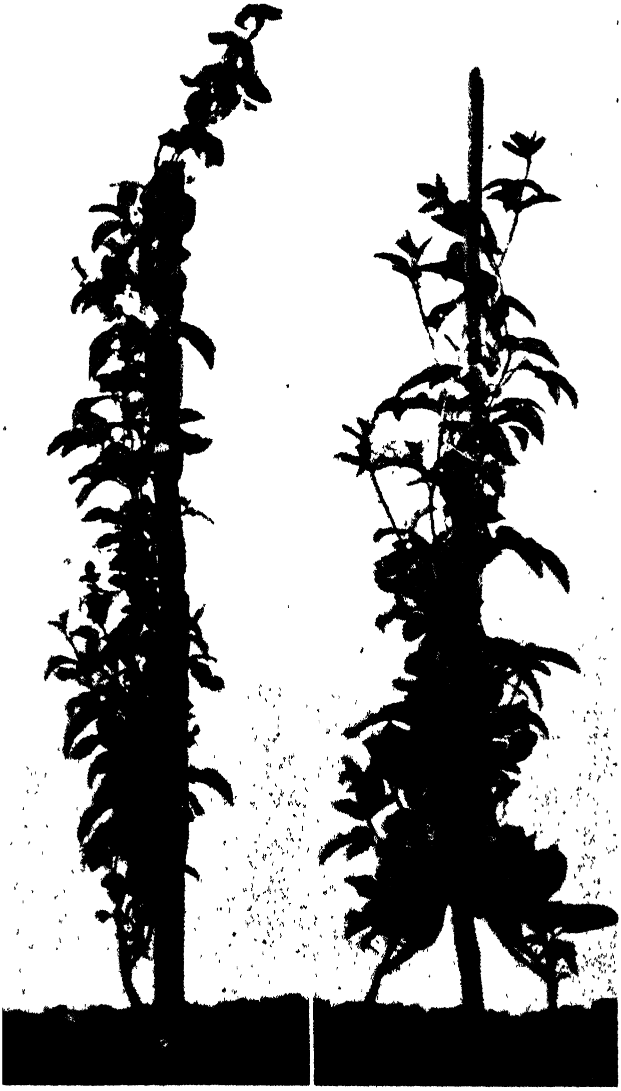

Fig. 5.—Stakes Supporting Young Vines.

be amply apparent. The holes should be sufficiently wide to perm
the roots being made to radiate naturally before the soil is fil
When pegs are used to mark the correct positions for the
planting board should be employed to ensure that the

accurately placed in those positions. The construction of the planting board and method of using same have also often been depicted and explained by the experts.

The vines are usually planted out when one or two years old, and then supported by stakes until trellises, with four or five wires, are erected. Should trellises constructed with three wires only, as shown in Figure 4, be in position prior to planting, stakes are also used to conduct the vines on to the wires, the lowest of which is further from the ground than when four or five are employed.

Figure 5,A. shows a two-year-old vine in position awaiting the erection of the trellis. This is the method adopted by Mr P. S. Chipperfield and most other growers in the Silvan district, and it has proved highly satisfactory. Success also accrues to Mr. J. Briggs' mode of treating the young vines. Here the seedlings, when one year old, are transplanted from the beds or drills into rows 3 ft. apart, with 1 ft. between each two plants in the row; then one stake is used to support each pair of vines until two years old, as shown in Figure 5,B. The seedlings in the illustration were photographed just prior to their being planted out. Mr. Briggs raises his own vines, and his method of planting is as follows:—The stake is drawn out, and each plant is carefully lifted, with its roots and soil intact. In this way growth is only slightly retarded, whereas when vines—particularly two-year-olds—are introduced from another nursery or district, they usually suffer considerably in transit. Tests were made when planting by placing the passions in pairs, but this method proved unsatisfactory, and was abandoned in favour of the single vine.

VI.—Tying up the Vine and Arranging its Branch System.

When the vines are planted out, and the trellises erected in the manner explained, the next operation requiring attention is tying them up on the wires, and when planted 12 ft. x 18 ft., as shown, there are 200 plants per acre to be handled. The desired symmetrical appearance and future stability of the vine's superstructure largely depends on how it is treated at the tying-up. This part of the work should, therefore, be done in a scientific and systematic manner and on the most approved lines. It should be generally understood that the passion, like the grape vine, produces tendrils which during their development take hold of branches, laterals, wires, &c., with which they come into contact, and are not easily detached when growth ceases and the tendrils become dry and hard. Now the advantages which follow the proper spacing and directing the leaders of the vine on the wires prior to the development of the tendrils will be easily realized. Strips of the green leaves of New Zealand flax (*Phormium tenax*) and binder twine (made from the fibre of the same plant) are generally used in tying up, and the bands should not be made too tight, as the leaders require sufficient room for natural expansion. Bands are tied at each point where the leaders come into contact with the wires, and sometimes, also where they touch the wooden droppers, or the vertical wires casionally employed to afford further support to the vines and ngthen the espalier.

he sketch in Figure 6 shows the mode of strengthening the trellis, picts four methods of trellising vines. It is desirable to keep constantly tense and the framework rigid, because a freely vibrating trellis is not conducive to the growth of passions. Seven to nine saplings about three-quarters of an inch in diameter, are employed to stiffen that portion of the trellis occupied by each vine. and these are woven about 18 inches apart, one against the other, into the wires, on the principle of wicker-work, as depicted at (*a*) in section A. Here also is the figure of a young vine which may be regarded as one or two years old, according to its development prior to planting out and the amount of attention bestowed on regulating its branch system of six leaders; and (*b*) shows the formation of the plant a year or two later, when the number of main arms have increased to twelve; while (*c*) with sixteen leaders, illustrates the fully developed vine of, say, five or six years old, and occupying the whole of the section of espalier assigned to it. It is not suggested that the main arms can be made to radiate from the crown as accurately as the lines drawn here to represent them, but the writer would invite experienced growers, as well as intending planters, to accept this as the most modern and approved plan, and in trellising their vines to imitate it as closely as they can

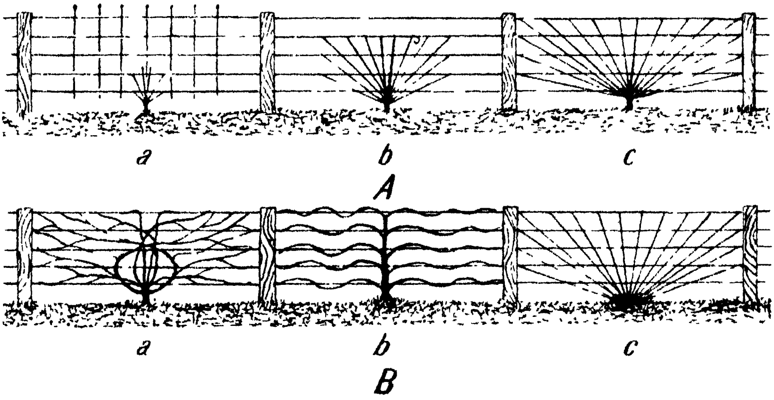

Fig. 6. Four Methods of Trellising Vines.

The type of vine recommended has a single stem, about six inches long, and only the main arms are shown. These give out numerous light laterals on which the fruit is produced. In order to maintain healthy, vigorous growth, with a view to producing fruit of the finest quality, as in the case of fruit trees (apples, pears, peaches, &c.), most of the laterals should be removed at the pruning. This can be much more easily accomplished when the leaders assume the positions shown and are made firm, than if allowed to become twisted into objectionable shapes, as so often happened during former years. The condition of affairs in recent years, however, has been much more satisfactory because of the growers' losses, due to lack of attention in this regard, and their having had ample time to make a calm survey of the position.

Three other methods of trellising are depicted in section B—shows a rather nice type of vine with single stem, and it w observed that the two outside leaders are drawn up from the as to describe a circle, cross each other at the centre wire, incline in opposite directions to the top corners of the esp other leaders inclining more to the vertical, cross each oth

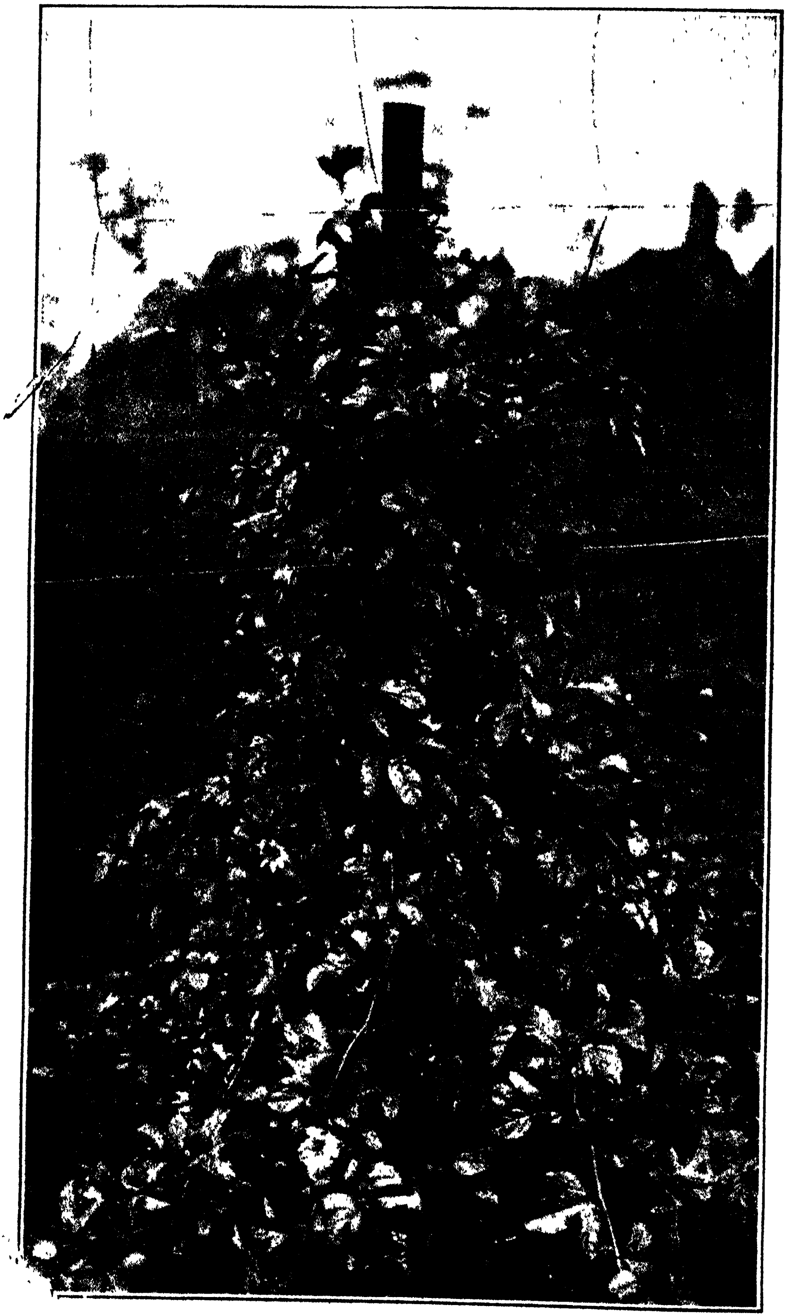

Fig. 7.—Three-year-old Vine prior to being tied up.

and again rise gradually to the top wire. The next pair of leaders rising from the crown describe such an angle to the vertical as to leave the usual space for the centre dropper. The fourth pair of leaders strike out almost horizontally, and are supported by the bottom wire as shown. Now it will be seen that the vacant spaces on the trellis are fillled in by sub-leaders, or side arms, growing on the main branches.

The mode of trellising passions shown at (*b*) has been practised only to a limited extent. This consists of bringing the main stem up to the top wire, and during its growth twisting the horizontal arms, produced from suitable nodes, around the wires and tying them in position. From what is known of this method it cannot be recommended, as the side arms rarely make uniform growth, indicating that a less equal distribution of sap is maintained through the centre stem than obtains when the leaders radiate from a crown. This method is largely resorted to in trellising grape vines. Pears are worked in this way at the Burnley School of Horticulture; and Mr. Tom Sebier, of Wandin, has several Burbank plums treated similarly, and these yield heavy crops of fruit.

In (*c*) we have the most undesirable formation. Here, instead of a single stem, the necessity of which has been previously emphasized, the leaders constituting the fan or framework of the vine are allowed to come from below the soil level. This type is of common occurrence, but should neither be planted nor grown, as it is practically impossible to keep the butts of the leaders free from fungi, and possibly deleterious soil acids, and particularly where wet soil conditions exist. Many vines of this formation have died through the rotting of the bark under the soil, even where no fungous organisms were found. There are other methods of trellising, and many modifications of those illustrated, but the one depicted in section A typifies, as far as the writer has been able to determine, the best and most practicable style for general adoption.

The young vine should be tied up as early as possible, so that its first produced tendrils may be utilized in clasping the wires, which offer support, and facilitates its systematic construction and satisfactory development. The plant appearing in Figure 7 is three years old, and although some are supported by the stake, most of its leaders are lying on the ground, having produced and expanded their tendrils to no advantage. Here also is seen the method of using vertical wires in lieu of wooden droppers to strengthen the trellis, which in this case consist of three horizontal wires, though at least four should be employed, as the bottom one is much too high from the ground level When not placed on the wires until the condition shown here is reached, the vine's subsequent development and general make up are rarely satisfactory. As this is such an important factor in passion culture, and so as to obviate faulty construction of the vine, the writer would again direct the reader's attention to the method depicted in Figure 6, section A, and learn that the plant should be trained from the beginning to exert the whole of its energy in the right direction.

In Figure 8 are given photographic illustrations of eight-ye[illegible] vines, depicting two of the classes of stems to which reference h[illegible] previously made. A shows a single stem with leaders str[illegible] from the crown six inches above the ground, but this [illegible] regarded as the best type of its class, as a sufficient nu[illegible] arms, sub-leaders and side shoots have not been encouraged to complete the framework. The required number of leaders may easily be obtained from the crown if judicious pruning be practised during the first few years of growth, but, like most kinds of fruit trees, the leaders become bare of fruit wood below if allowed to produce too many side arms or shoots above, as may be seen by the picture. The leaders are sometimes cut hard to remedy this defect, and good growths are often produced, but, the resultant framework is rarely as substantial or the vine as fruitful, as when properly trained at the beginning. B is one of the class which establishes itself by throwing up two or more leaders from below the soil level, and for this reason is afterwards subject to the disadvantages previously mentioned. Vines of this type are rarely selected for planting. What usually happens is that after being planted out the seedlings are cut down by frost, causing numerous suckers during the following period of growth to come from that part of the stem immediately above the root systems. Then instead of selecting one of the most suitable of these growths for a single stem, and keeping the others suppressed until the basal buds die out, all the growths are allowed to remain, causing extra labour and anxiety not experienced in treating the single stems. The specimen under review has three stems, but is nevertheless a healthy and productive vine. This part requires more care and attention, however, because of the disabilities explained than the single stem. The fungous organisms, or lowly forms of vegetable growth which attack the roots and stems, as well as those which affect the foliage and young growths, thrive best n moist shaded situations. It is therefore advisable, if at all prac- able when planting, to run the rows north and south so that the ung sun may shine on the east side of the trellises and on the west the afternoon.

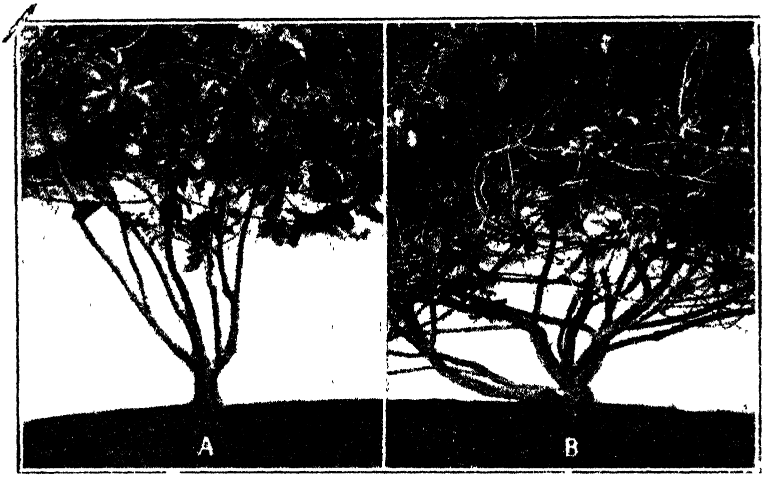

Fig. 8. - Sections of Two Eight-year-old Vines.
A shows the approved stem, and B the objectionable.

kinds of vine supports, such as wooden frames, upright posts -pieces, lattice-work, &c., tried in the past and proved s, have been abandoned in favour of the wire espalier.

Experiments are being carried out, however, to further test the efficiency of modified forms of the wire trellis, and these methods—two of which are illustrated here—are being tested in Mr. A. Baker's orchard at Wandin. One of these consists of a row of rough split

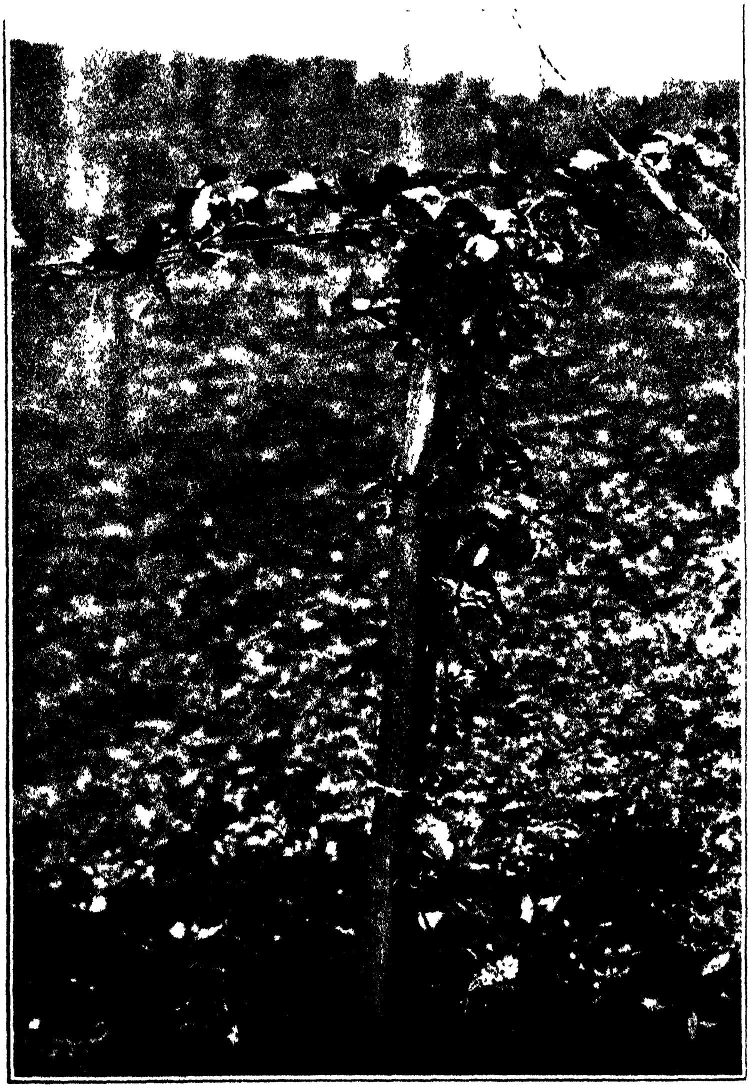

Fig. 9.—Experimental Trellising.

4 ft. posts 12 ft. apart, along the tops of which two parallel wires ar
fastened two inches apart. A four-foot stake between each two p
conducts a single stem vine to the wires, along which the leade
trained, as shown in Figure 9. In the other type the posts are
and a twelve-inch cross-piece of 2 in. x 1 in. hardwood is u

feet from the ground to each post. The cross-piece supports two parallel wires in saw-cuts ten inches apart as may be seen in Figure 10. Stakes are used in this case also to guide the vines to the wires, on which the branches are placed similarly to those in Figure 9. As the

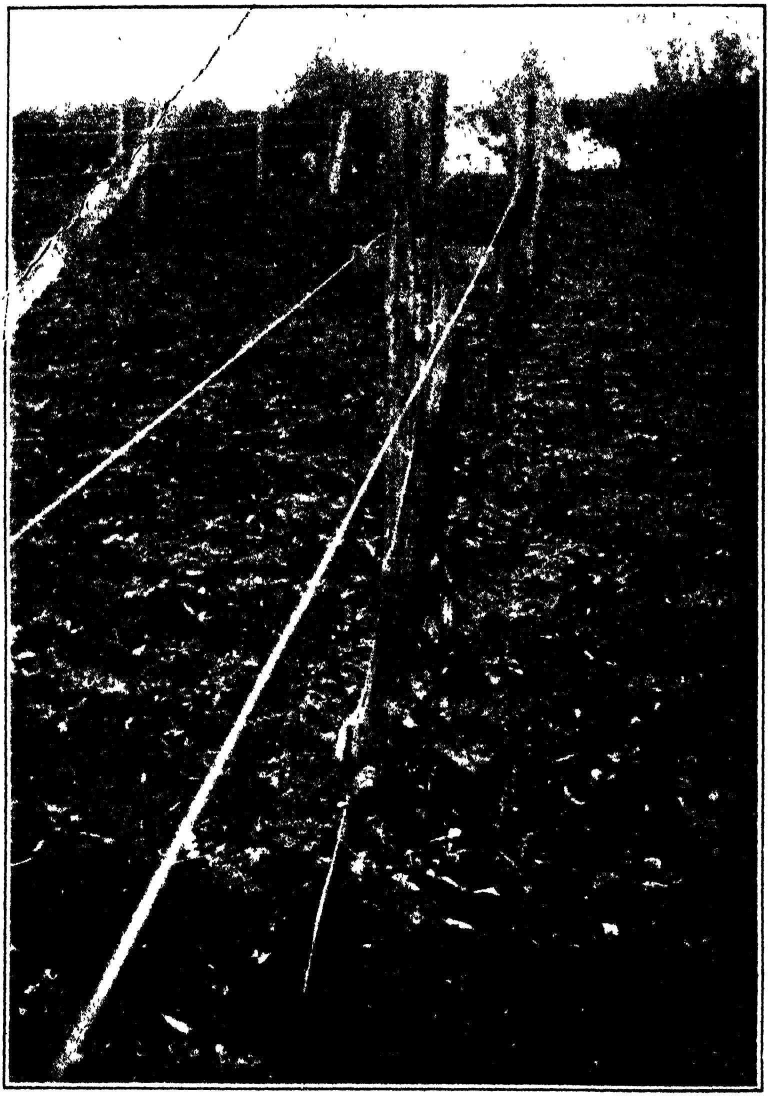

Fig. 10.—Experimental Trellising.

s develop and the leaders creep along the wires, the fruit laterals suspended beneath, and the results of this method of trellising ria will be watched with interest.

(*To be continued.*)

SUCCESSFUL DAIRYING IN GIPPSLAND.

By W. J. Yuill, Dairy Supervisor.

Sixteen years ago, "Blossom Flat," situated in a bend of the Latrobe River, 5 miles north from Morwell, was a wilderness of swamp gum, tea-tree, sedges, rushes, and weed pests, such as may be found on most unimproved and neglected farms. To-day it is a comparatively clean, and high-producing property.

The history of the success of Messrs. Howlett Bros., the present owners, is worth recording, because the system followed by them, and the success attained, can, to a greater or lesser degree, be repeated by many dairymen working under similar conditions.

The statement that any one can be a dairyman is, in a measure, correct, only needing the qualification of sufficient capital to commence operations, and ability to milk the herd. But to be a successful dairy farmer requires the further qualification of ability to successfully direct every effort, and make the farm a payable business proposition.

The owners of "Blossom Flat" have built up their dairy farm on sound lines, and probably in no other district could there be found two more satisfied and optimistic dairymen. It may be said that with such land and cows, this may well be so; yet their present position is but the outcome of sustained effort and intelligent work.

They state that when, in 1906, they rented this 140-acre property for three years, with the option of purchase, the value represented in their stock, implements, and cash did not exceed £250; and that their knowledge of dairy farming was also very limited. The cream cheques for the first year's work amounted to £80, and the carrying capacity of the farm was so low that the dairy herd of seventeen head, with their calves, had to be pastured elsewhere for several months to save them from starvation.

Owing to a considerable area of the farm being lower than the river bank, this was left, after each flood, covered with water, which remained until it slowly evaporated or soaked away. In these backwater areas, driftwood collected, and a growth of water weeds and rushes was encouraged, leaving them sour and of little value for grazing purposes. This was quickly recognised as the first obstacle to be overcome, and a system of drains was laid down, these varying in width and depth from a few inches to several feet, and sufficiently extensive to give even a casual observer some idea of the difficulties which had to be faced.

So successfully was their work of drainage carried out, that the farm is now entirely free of water within a few days after any flood in the river has receded. The whole of farm was thus gradually brought into working order, and is now carrying a splendid sole of rye, together with many species of introduced clover, including Dutch White (*T. repens*), Alaske (*T. hybridum*), Red (*T. pratense*), Cluster (*T. glomeratum*), Subterranean (*T. subterraneaum*), Perennial Strawberry (*T. fragiferum*), Birdsfoot (*Lotus major*); also several of the native trefoiliums; while *Paspalum dilatatum* also flourishes. On no othe farm has the writer seen so much value placed on the clover in pasture, or so much care given to its cultivation.

After working the property for a number of years, it was co that better results could be obtained by working from tw

The farm was therefore divided—sheds and dwelling being erected on the 80 acres now owned by Mr. E. H. Howlett; and the front 60 acres was retained by Mr. Harry Howlett—both farms being considered to have an equal carrying capacity.

Top-dressing the pasture has been proved to give excellent results on even the richest river flats. Mr. E. H. Howlett also top-dressed a paddock of paspalum and birdsfoot trefoil, which he cuts for winter feeding. This paddock, after being top-dressed with a bag of superphosphates to the acre, gave twice as much hay as in any previous year, and the growth of trefoil greatly increased. A lime and manure spreader has recently been purchased in order that top-dressing the pasture may be more effectively carried on. Mr. Howlett always finds time to go over the paddocks after the first rains in autumn, and again in the spring, with a [illegible] arranged to break up manure stock

Four of the Leading Cows in Mr. H. Howlett's Herd, sired by Cobra.

Their average for 273 days under official test was 7,917 lbs. of milk and 368 lbs. of butter fat. Testing proves Cobra to have been a wonderfully prepotent sire.

and spread it more evenly over the land. Some shelter is provided; but it is intended to give more attention to this matter in the future.

The cows were rugged this winter for the first time, with satisfaction to the animals and the owner.

Mr. E. H. Howlett is well known throughout the district for his advocacy of the Jersey breed. He has recently purchased some pure-bred cows of noted show-ring and utility strains, and also a pure-bred Jersey bull from the "Banyule" Jersey stud. This bull is "Duke of Banyule," a son of "Milkmaid's Chief," and is out of "Mary Ann of Banyule," a cow which yielded 441 lbs. of butter-fat on her second calf.

The average yield on this farm last season was 250 lbs. of butter-fat, according to the factory returns, although the herd included eight three-year-old and six two-year-old heifers. When four months in milk, the three-year-olds were averaging nearly 10 lbs. of butter-fat per week, and the two-year olds 8 lbs. of fat. For the previous year, the herd averaged £26 8s. 2d. per head, half of the herd being two-year-old heifers.

With the exception of the paspalum and birdsfoot trefoil hay, no other hand-feeding is given. At the time of my visit, all the stock on the farm were being liberally fed on this, which, apparently, was quite relished, as no waste occurred.

After seeing the Yinnar Testing Association at work on his brother's farm, Mr. E. H. Howlett is of the opinion that the yearly subscription is money well invested; and his herd is now entered in this Association.

Mr. Harry Howlett's farm is unique, in that an area of 60 acres supports the owner and a share farmer, who does all the dairy work. Thirty-five cows were milked last season, and their records of milk from daily weights, and the butter-fat estimated from the official monthly test of the Yinnar Herd Test Association is given on page 22.

All the feed supplied to the herd was grown on the farm (with the exception of half a bag of bran, which was fed to Melba, the best producing cow, during the last month of the season). Eleven acres of maize was grown, and this, together with the splendid pasture, maintained the milk flow until late in the autumn. As a result, the herd, including seven two-year-old and five three-year-old heifers, averaged £14 8s. for butter-fat, or £8 4s. per acre for the year; while the gross return from the farm, not including the value of the young stock, was £12 13s. 6d. per acre. The gross return from this 60-acre farm for the preceding year, when 30 cows were milked (as shown in the income tax return), was £987.

During the year, the leading twenty cows average 6,258 lbs. of milk, and 297½ lbs. of butter-fat. The best cows gave 8,152½ lbs. of milk, with an average test of 4.91, and 400 lbs. of butter-fat. The leading two-year-old heifer "Ruby" produced, in 236 days, 4,879 lbs. of milk, with a 4.88 per cent. test, and 238 lbs. of butter-fat; while four of the three-year-old heifers are among the twenty best animals in the herd. Some of the heifers calved late, and did not complete a full nine months by the time the Association's year closed; otherwise the figures of some of them would have shown to still better advantage, some havi averaged over 1 lb. of butter-fat daily while being in the test. highest and lowest monthly test of each cow is given herewith. an illustration of the futility of using a single test to deter

View of Mr. H. Howlett's Milking Herd. Homestead and milking-shed in the distance.

Some of Mr. H. Howlett's Milkers, showing type and constitution.

value of a dairy cow. The wide variation of these tests should point conclusively to the folly of including or rejecting any cow on a single test, which practice is sometimes followed. Nothing but a series of tests to determine the average test is of any value, and this knowledge does not make us much wiser concerning a cow's actual value without we have a record of the amount, or weight of milk for the period.

The two-year-old and three-year-old heifers on both farms are by "Merrygirl's 4th son of Melrose," ex "Merrygirl the 4th," sired by the famous imported Jersey bull "Pretty Noble." There is more than coincidence in the fact that the only four daughters now on this farm of a bull named "Cobra" (also by a Woodmason-bred bull) are among the five best cows of the herd; while the two leading cows on Mr. E. H. Howlett's farm carry the same line of blood. The exceptional merit of these two bulls is now appreciated, it having been clearly demonstrated by the test record. All stock are dehorned before coming into the milking herd, and with the horn appears to go the fighting spirit, for there is practically no trouble, either in the milking yards or while the cows are being hand fed; udders damaged by horns are consequently unknown.

Mr. E. Howlett's "Pet" Family—all proved producers, showing the advantage of breeding from a cow known to be dominant in milking character.

Undoubtedly, the splendid condition of the pasture is one of the main factors in the high production of these herds. It is too often forgotten that the feed nutrients contained in grass from such pasture land are those considered by the agricultural scientist to be the most suitable for milk production; and also that the ratio of proteids to carbohydrates in it conform to the accepted standard of a balanced ration. Mixed pasture containing a large percentage of clovers is

View of Mr. H. Howlett's Milking Herd. Homestead and milking-shed in the distance.

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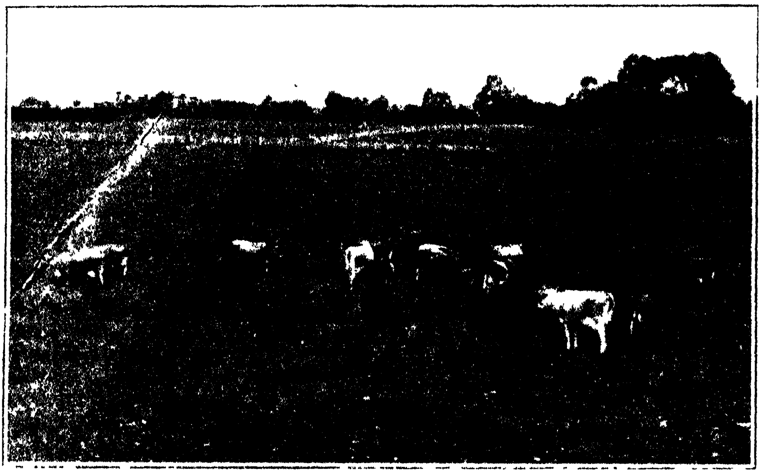
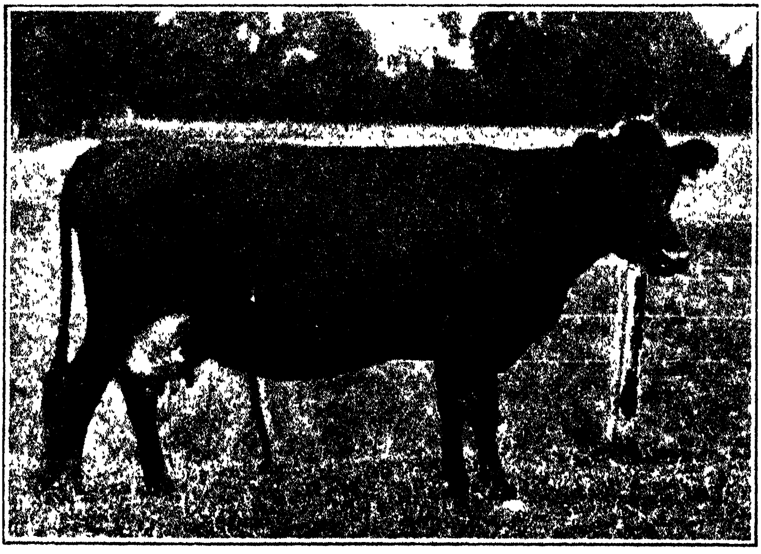
While Messrs. Howlett Bros. are keen supporters of the Jersey cow, they are under no delusion regarding the fact that unprofitable cows



A View of Mr. E. Howlett's Flats, where clover is abundant as a result of top-dressing.



"Melba," Mr. H. Howlett's best producer. Her official figures for November last were 52 lbs. of milk, 4·6 test = 2·39 lbs. of butter per day.

are to be found in their fancy breed. This is the reason why they are practical advocates of the District Herd Testing Association. In a simple, although unorthodox, way they have been herd-testing for years, and undoubtedly their present high-producing herd is, in a measure, due to their efforts in that direction.

The Association system of herd testing is making considerable progress in Gippsland; and there are dairymen who see in it their ultimate salvation.

It will be well to remember, however, that any other part of the dairy farmer's work, *except the feeding of the cows*, will withstand neglect for a time without immediate loss to the owner. Good cows we must have, better bulls are essential to progress, and testing is only a common-sense business principle; but any departure from good feeding will immediately show itself in the monthly returns. A poor cow on good feed may even become more profitable than a good cow on poor feeding. Three years ago, there came under observation a dairy herd which averaged 98 lbs. of butter-fat per cow for the year. This was not because the cows could not produce more, but because they were only half fed. Half rations are fatal to production. It would almost seem that some farmers fear that their cattle will suffer from over-feeding, as with a race horse, so much care appears to be taken in keeping them in a lean and racy condition.

"Pet," Mr. E. Howlett's leading cow, showing dairy type and constitution; now twelve years old, but still one of the best producers on the farm.

Messrs. Howlett Bros. know well that good, liberal feeding is the foundation of successful milk production, and the whole of their efforts have been given to keeping their cows fully supplied with all the fodder that they can eat at all times, just as they would in good pasture in the flush of the spring.

By their industry these two men have turned a wilderness into a most productive farm, and they are still working for the further improving their herds and farms. Opie, the eminent English painter, when asked what he mixed his paints with, replied, "With brains, sir." Intelligence is just as necessary in conducting a successful farm as in painting a picture. Acres, cows, and sheds may constitute a dairy farm, but if success is to be achieved, "brains" are required to direct the brawn and properly handle each part of the work. The results obtained on each of these farms discussed are better than from many herds where liberal feeding of concentrates is practised. This goes to prove the thoroughness of their working methods, and shows that they are worthy of emulation.

A careful study of the figures given below will be worth while, as they provide much food for study. The greatly increased value of the holdings, and the present splendid cash returns received, are the reward of the hard but effective work in the early years of draining, clearing, and subsequent attention to the details of feeding and general farm management. To these do the Messrs. Howlett Bros owe the satisfactory position that they hold to-day.

MR. H. HOWLETT'S HERD TEST RECORD.

Name of Cow.	No. of Days in Test.	Lbs. of Milk for Period.	Composite Test of Period.	Highest Monthly Test.	Lowest Monthly Test.	Butter Fat for the Period.
Melba ..	273	8,152½	4·91	5·7	3·8	399·86
Blossom ..	273	8,192½	4·56	5·9	4·2	373·79
Beauty ..	273	7,799	4·18	5·4	4·3	356·54
Mabel ..	273	7,363	4·51	5·4	4·2	332·55
Clara ..	273	7,517½	4·40	5·8	4·3	330·86
Dusky ..	273	6,095½	5·30	5·8	4·3	325·64
Jessie ..	273	5,670	5·40	6·3	4·0	306·50
Countess ..	273	6,192½	4·93	5·5	4·4	305·66
Star ..	273	6,843½	4·34	4·9	3·7	297·38
Trilby ..	273	8,025	3·65	3·9	3·3	291·83
Elaine ..	273	5,695	4·98	5·7	4·0	283·38
Laurel ..	273	6,015	4·71	6·0	3·2	283·57
May ..	273	5,898½	4·54	5·1	3·8	268·56
Daphne ..	273	5,751	4·65	5·6	4·1	267·41
Myrtle ..	236	5,981	4·37	5·0	3·7	261·65
Lou ..	236	5,171	4·97	5·9	4·3	256·55
Violet ..	243	5,123½	4·99	5·5	4·1	255·48
Bonnie ..	264	5,040	5·00	5·3	4·6	251·36
Lovely ..	243	5,343	4·68	5·3	4·3	250·80
Biddy ..	236	4,795	5·14	6·4	4·2	246·37
Ruby ..	236	4,879	4·88	5·3	4·3	238·18
Tot ..	244	4,708	4·12	6·0	4·0	227·85
Amy ..	225	4,144½	5·10	5·8	4·1	211·88
Bud ..	225	4,355	4·80	5·9	4·1	208·96
Dulcie ..	203	3,249½	5·60	6·0	4·1	182·17
Ivy ..	203	4,422½	4·67	4·9	3·9	181·61
Flower ..	215	3,553	4·75	5·6	3·8	168·80
Annie ..	210	3,235	5·10	5·7	4·7	165·37
Dolly ..	123	3,345½	4·84	5·3	4·7	162·52
Winsome ..	181	2,926½	5·00	5·8	4·1	146·88
Comet ..	89	2,196	4·35	4·7	4·1	95·34

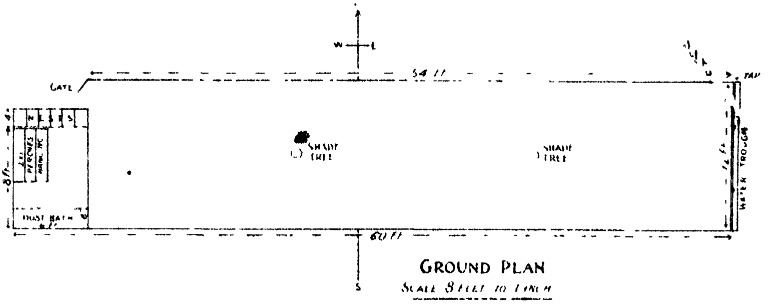
* * *

POULTRY HOUSE.

WHICH MAY BE USED AS A BREEDING PEN.

By W. C. Rugg, Poultry Foreman, Werribee Research Farm.

The class of breeding pen illustrated below would be found suitable for housing up to twenty layers. Such pens have proved very satisfactory at the Werribee Research Farm, and they may be inspected there at any time by appointment.



Plan of Poultry House and Yard suitable for Breeding Pen or to House Twenty Layers.

Material Required.

If desired, such a house may be built simply. The material required is as follows:—

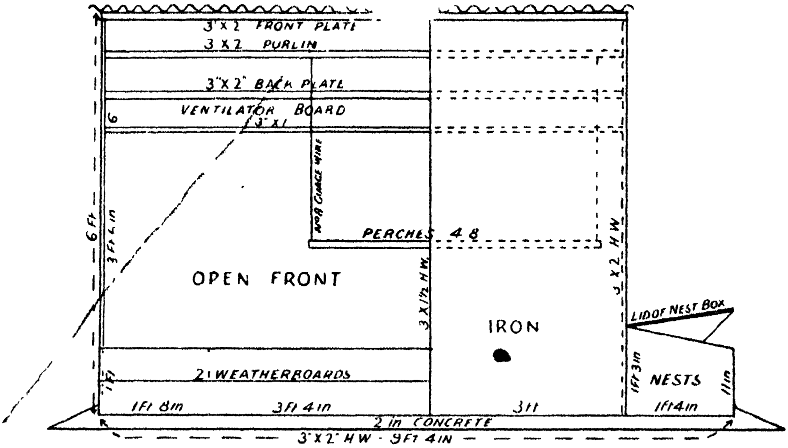
Size of house—8 feet by 6 feet, 6 feet high in front, 5 feet at back.
Blocks—4 x 4 red gum.
Floor—Concrete, 2 inches.
Bottom and top plates—3 x 2 hardwood.
Purlin—3 x 2 hardwood.
Corners—3 x 2 hardwood.
Studs—3 x 1½ hardwood.
Battens—3 x 1 hardwood.
Perches—2 x 1 hardwood.
Ventilator—Weatherboard pine.
Lid of nest box—Weatherboard pine.
Back and ends—Plain galvanized iron, 26 gauge.
Roof—Corrugated galvanized iron, 26 gauge.
Nests—Kerosene or petrol tins.

Method of Building.

If frame is built, and the iron put on inside of the back and sides, very little harbour is left for vermin to breed in.

A portion of the front (a width of three feet) is enclosed with a sheet of iron 6 ft. x 3 ft. The remaining five feet is boarded up one foot, two weatherboards being used so as to confine the scratching material and prevent waste.

A dust bath is constructed by fixing a piece of corrugated iron 6 ft. by 1 ft. on edge, eighteen or twenty inches from the wall furthest from the nests. In this should be placed from six to eight inches of sand and ashes. The rest of the floor should have six inches of scratching material spread over it.

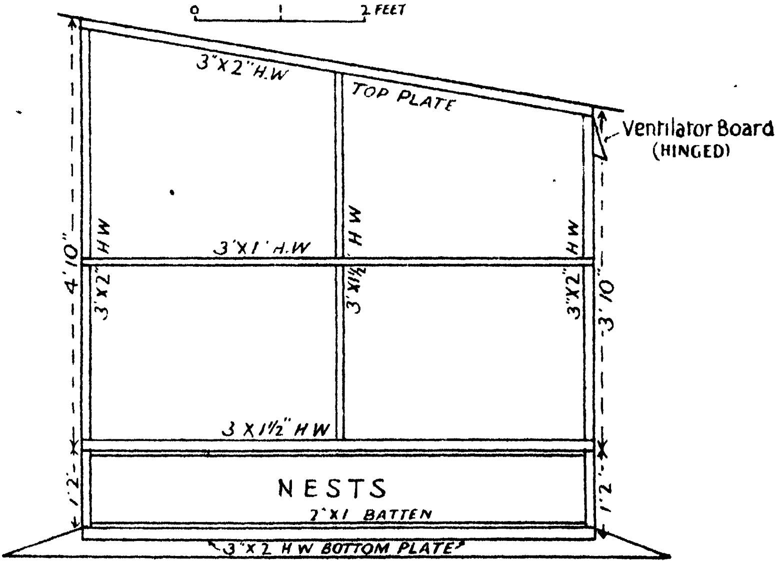


FRONT ELEVATION

0 1 2 FEET

BACK FRAME

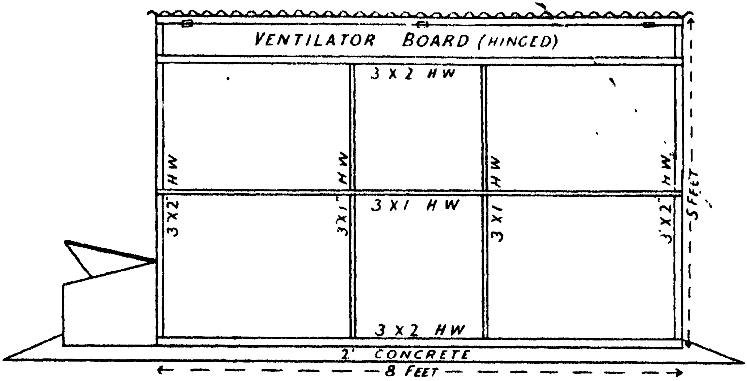
0 1 2 FEET



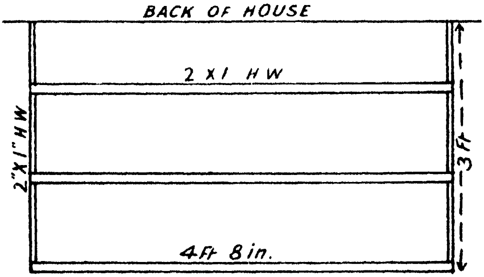
NORTH-END SECTION

0 1 2 FEET

The perch frame shown in the sketch is large enough for twenty birds, and if suspended from the roof 2 ft. 6 in. from the floor by four pieces of wire, there will be no obstruction on the floor to broom or scraper used by the attendant when cleaning the house. All perches should be at the same level, and not less than two inches wide, and they should be removed at intervals and painted with kerosene, to prevent vermin breeding in the crevices.



BACK FRAME



FRONT PERCH

Roosting Frame.

This should be suspended from the roof by a piece of No 8 fencing wire passed through holes at each of the four corners, so that all perches may be on the same level. The two projecting ends are to prevent the perches swinging against the back of the house.

The frame may be made from 2 in. x 1 in. hardwood battens. It should be given two coats of hot tar; this will fill up all crevices in which vermin are likely to breed.

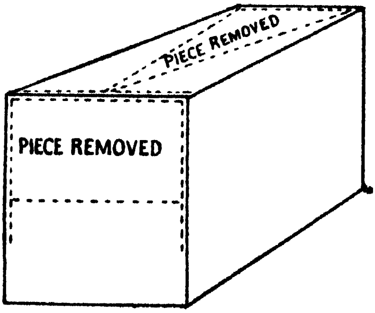
Shade for Poultry in Yard.

Shade trees should be planted in the yards. Several varieties have been planted in the poultry yard at the Research Farm, but the most satisfactory one is the boobialla or boobyalla (also sometimes spelt bubeala). Some planted two and a half years ago are now five feet high and as many feet in diameter, and are covered with dense foliage. They are very hardy, and can be pruned to any shape desired. It is necessary to place a guard round them for the first twelve months to protect them from the birds. After that they will hold their own.

A Device for Catching Fowls in the Pen.

A handy implement for catching fowls in the pen can be made with an ordinary rabbit net, a piece of No. 8 galvanized fencing wire, and a light stick. Bend the wire, which should be not less than six feet, into a circle twenty inches in diameter, and make the two ends of the wire straight, and fasten securely to the stick, which should be five to six feet long, and then lace the rabbit net to the wire.

With a little practice birds can be easily caught in this net without risk of doing them any injury.



Nest Made from Kerosene Tin for Poultry House.

Cut tin along dotted lines, remove the three-corner piece on the top and bend the rest upwards. Remove the piece at the end and then cut the end down a further 2 inches, and bend this 2 inches over the 2 in. x 1 in. batten shown in the plan of end section.

Six tins will be required.

WEEDS AND THEIR ERADICATION.

(Continued from page 670, Vol. XX.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Hoary Cress, *Lepidium draba*, L., *Cruciferæ.*

This cruciferous plant, a native of Europe, was probably introduced here as an impurity in seeds, and is now very widely spread throughout Victoria.

It is a hoary, pale-colored plant, with perennial root-stocks (Fig. 51). The stems are erect, with oblong leaves; the upper ones are auricled and clasp the stems, while those placed lower down possess short stalks.

The flowers are white in colour and very small, and are supported on slender hair-like pedicels, that spread out widely from the axis. The flowers on each stem rise to about the same level, thus giving the plant a more or less flat-topped appearance (*corymb inflorescence*).

The ovary develops into a small pod, having a long style, which, apart from its other characteristics, will help considerably in the identification of the plant. Like other members of the cruciferæ, it is a heavy seeder, and in addition to this, small pieces of severed root-stock are able to produce buds, and thus form new plants.

Unfortunately, it is rejected by stock, and frost does not appear to cause any hurt to its seedlings. The plant, therefore, has every chance of becoming one of our worst weeds. It, however, has one weak point—its inability to withstand a deficiency of moisture in the soil.

The first step towards the control of hoary cress should be to prevent it from producing seed, and to take care that portions of its underground stems are not scattered during ploughing operations.

Hand-pulling will check it only temporarily, unless the operation is frequently carried out, as, owing to their nature, the root-stocks cannot be completely withdrawn from the soil—the plants usually breaking off and leaving portions of root-stock behind; these quickly form new buds, from which, later on, stems will make their appearance.

Hoary cress, which has become a serious pest in many wheat-growing districts, is often further spread during cultural operations. In places where it occurs over large areas, it would be advisable to leave the land out of cultivation and under grass, and then to wait for a long dry spell after harvest, before attempting any cultivation. Care should be taken, in the meantime, to prevent any plants from seeding, either by mowing or hand-pulling them.

It is advisable to make certain that the land is dried out to a depth of at least a foot, it should then be ploughed at varying depths, and afterwards thoroughly scarified. If moisture is present in the soil, ploughing operations should be delayed, otherwise the severed pieces of root-stock, scattered all over the paddock, will not dry out, and the weed may become more widely spread than it was previous to the steps taken for its eradication.

Hoary cress thrives best on moist soils, and quickly suffers from droughty conditions, so that the necessary practice of fallowing land

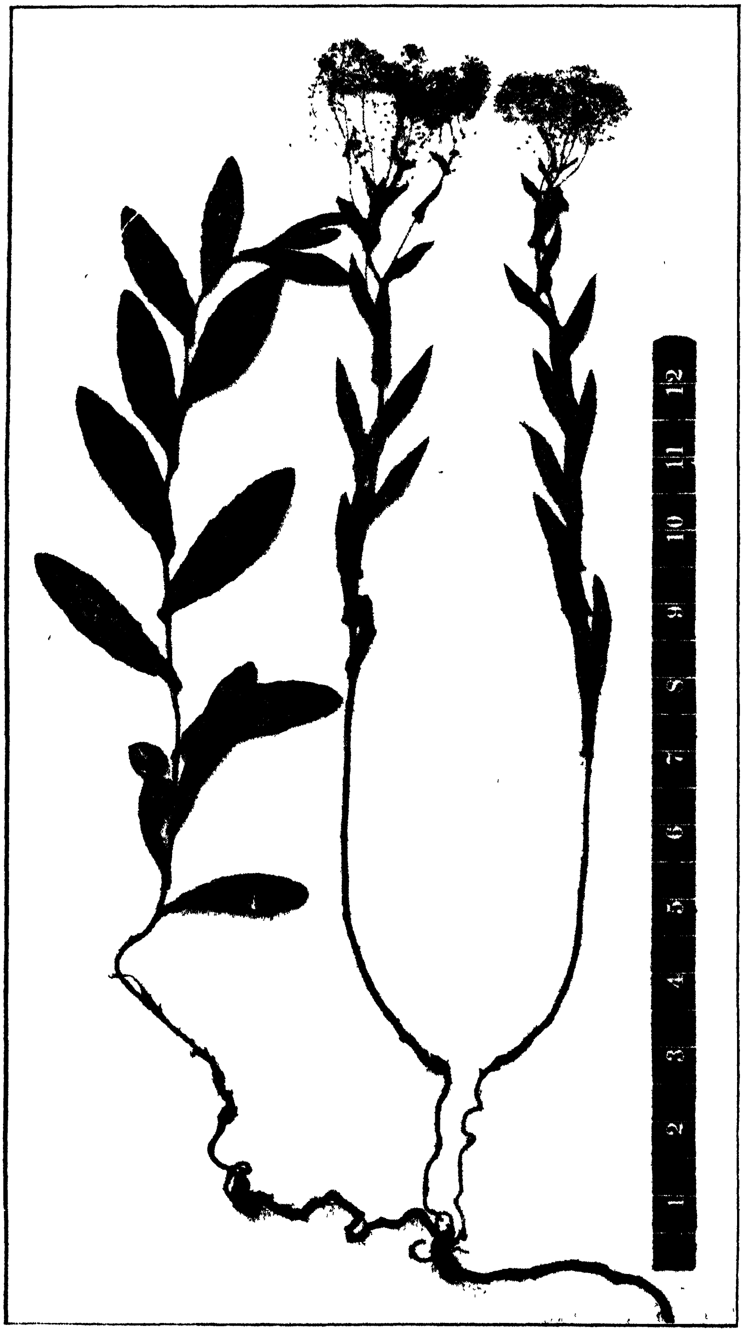


Fig. 51.—Hoary Cress, *Lepidium draba*, L. (Obtained at Werribee, October, 1922.)

for the purpose of conserving moisture is, unfortunately, all in its favour.

Where hoary cress occurs in small, scattered patches, the plants should be carefully dug out and burnt, or they could be killed by covering them with sheets of iron or other material.

Where the latter method of eradication is to be attempted, the plants should first be hand-pulled or deeply hoed out, and the plots of ground previously occupied by them covered over with sheets of galvanized iron or bark, which should overlap sufficiently to exclude all light. It is important to see that any nail holes present in the iron are also covered, otherwise light will enter, and young plants will grow through the holes. Sheets of strong paper, tarred, and held in place by means of stones or earth will answer the purpose.

Weak arsenical sprays applied as often as shoots appear would have the same starving effect on the roots of this plant as would summer cultivations, and, on account of the small quantities of this material necessary to destroy all top growth, it would be less liable to cause injury to the soil than if salt were used as a herbicide, as the latter would have to be applied in fairly large quantities to cause the same amount of injury to the plants as an arsenical spray.

Sprays that exercise what appears to be a selective action, such as iron sulphate or copper sulphate, have been tried against hoary cress present in growing crops, but, so far, not with very much success. These sprays appear to be selective in their action, but the reason appears to be that grasses and cereals, although injured to some extent by them, recover much more quickly from the sprayings, owing to their greater resistance to this injury. This is probably due to their entirely different habit of growth, as cereals belong to the group of plants known as *Monocotyledons*, whereas hoary cress is a *Dicotyledon*, and develops an entirely different root-system from that of cereals. In the case of cereals, their growth is made from the centre, which is largely protected by the outer leaves from the action of the spray, and is less liable to receive injury from this source than the more exposed surfaces of hoary cress and other *Dicotyledons*.

In America carbon bisulphide is sometimes used against hoary cress. The following appears in the *Monthly Bulletin* of the Department of Agriculture, State of California, for February and March of this year: –

> "Small infestations, where isolated, may be eradicated by means of carbon bisulphide—inch holes, about eighteen inches apart each way and sixteen inches deep, into each of which may be poured two ounces of the fluid, then covered."

Hoary cress is proclaimed under the Victorian Thistle Act for the whole State of Victoria.

Hedge Mustard, *Sisymbrium orientale*, L., *Cruciferæ.*

This weed of waste lands is becoming a common plant in cereal crops, and is likely to become very troublesome where it is allowed to seed itself unchecked, as it produces an enormous amount of seed.

The flowers are small and pale-yellow, the seed pods being long and slender and exceedingly numerous (Fig. 52). The pinnatifid

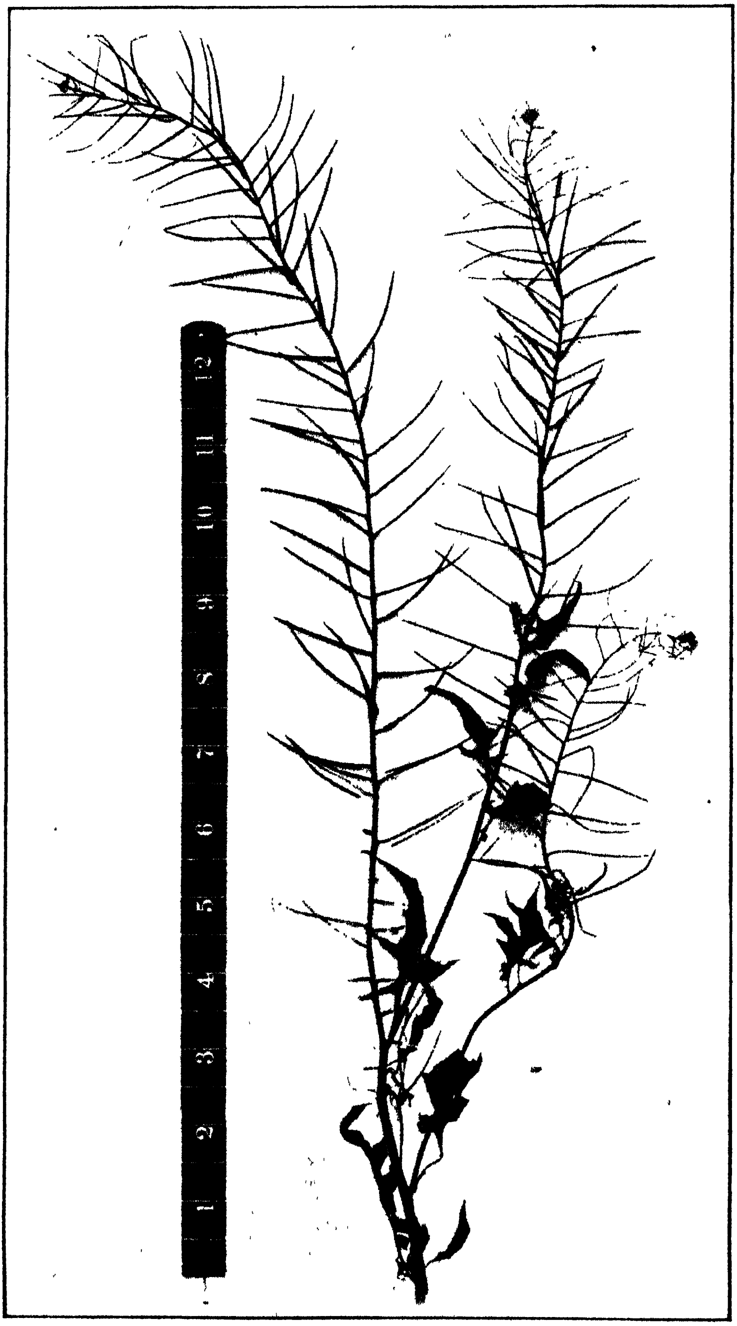


Fig. 52.—**Hedge Mustard or Oriental Rocket,** *Sisymbrium orientale*, **L., showing the large number of seed pods borne by one plant. (October, 1922.)**

leaves are stalked and clothed with soft hairs. The plant is an annual or biennial.

It should be hand-pulled wherever it is found growing, and if it is carrying seed-pods the plants should be collected and destroyed by burning. This weed is another introduction from Europe, probably arriving as an impurity in seeds.

Hedge mustard has not yet been proclaimed under the Victorian Thistle Act.

(To be continued.)

OVERSEAS SHIPMENT OF FRUIT.

REASON FOR FAILURES.

Report by Exports Superintendent.

During last fruit export season thirty-nine steamers carried apples and pears (chiefly apples) from Australasia to the United Kingdom.

The results have been tabulated, showing names of steamers, dates of loading, dates of arrival in England, quantities and varieties shipped from New South Wales, Victoria, Tasmania, South Australia, Western Australia and New Zealand, system of cooling on steamers, condition on arrival, result, estimated losses.

Although damaged fruit was delivered from twenty-eight vessels, the percentage of loss in some instances was small, and generally the results may be recorded as:—Twenty-one shipments arrived at their destination in good condition, seven turned out fairly, and eleven reached London with a considerable portion of the fruit damaged and bad.

Comparisons of Size of Shipments—Methods of Cooling—Lines of Steamers—Temperatures, &c.

Nine steamers, which carried cargoes ranging from 84,000 to 170,000 cases (representing nearly 45 per cent. of the total shipments for the season), were responsible for an estimated loss of £209,235, or 90 per cent., out of the total estimated loss of £232,500. (The loss shown represents the difference between the price realized for the good and the damaged fruit. It may be mentioned that when damaged or inferior fruit or meat or butter is on the market, the price for the good stuff is detrimentally affected; therefore, it may be assumed that the actual losses were much greater than shown). Eight of these steamers were fitted with pipe grids in the holds for brine circulation. One steamer had grids in some holds and air circulation in others. In contrast, two other steamers, carrying 82,000 and 91,000 cases respectively, fitted with battery and air circulation, landed their fruit in good condition.

Nineteen of the steamers used were fitted with pipe grids in the holds, five of which carried their fruit well, and delivered it in good condition. The result in the case of five others was "fair and variable," whilst the cargoes of the remaining nine were damaged and bad.

Seventeen vessels were fitted with the battery and air circulation system. Sixteen of them delivered their fruit in good condition, and one shipment was reported "fair, some over-ripe."

Three boats had some holds fitted with pipe grids, and other holds served with air circulation. One of these delivered the fruit in "fair to good" condition, and two steamers landed the goods in "variable and bad condition."

With reference to the five vessels with the grid system that turned out well, one carried a total of less than 3,000 cases, three from 37,000 to 66,000 cases from one port each, and one 50,000 cases from two ports. The five steamers with grid system which turned out "fair and variable" carried from 8,000 to 16,000 cases each, and all from only one port.

In the case of the seventeen steamers installed with the battery and air circulation system, five loaded cargoes ranging from 31,000 to 91,000 cases at one port only. One took a total of 56,000 cases from two ports, whilst the remaining eleven vessels carried cargoes from three and five ports each, totalling from 16,000 to 84,000 cases.

Six lines of steamers, representing twenty-one vessels, carried fruit satisfactorily (nearly all good, sixteen all right, and five good to fair and variable). The aggregate losses were nominal, ranging from averages of from 1½d. to 5½d. per case.

Three lines of steamers, which carried 60 per cent. of the season's fruit, in most instances delivered their cargoes in unsatisfactory condition, the average losses for all the vessels of each line being from 2s. 9d. to 4s. 6d. per case.

Although there was little difference in temperature during loading at Hobart and Melbourne between the successful and unsuccessful shipments, the average maximum temperatures at time of loading in Adelaide was 82.3 deg. Fahr. in the case of successful shipments, and 89.5 deg. with the unsuccessful boats. At Fremantle, the successful vessels loaded at an average maximum temperature of 79.7 deg., and the unsuccessful steamers at 90.3 degs.

Comments.

As most of the very large shipments turned out badly, it might be suggested as a remedy to limit the size of shipments. This, however, is not practicable, as all the available space is required during the shipping season, and with the growth of the trade, if it is given a chance to expand, the tendency will be in the direction of larger shipments instead of smaller cargoes.

To sub-divide the large holds is equally impracticable, as to secure any effective result would often involve the vital construction or arrangement of the vessel, such as the putting in of new hatches, &c.

The remedy within reach would appear to be the installation of the battery and air circulation system in all steamers carrying fruit, but here again difficulties loom up—the cost of doing so. Those with pipe grids installed in the holds are suitable for frozen meat, butter, &c., and are regarded as better for meat than air circulation.

The best likely to be achieved is to improvise means for air circulation with the grid system when fruit is carried. This can be done, of course, with the sacrifice of stowage space, as walls or bulk-heads and chutes would require to be erected inside the holds.

Extraordinary provision for air circulation is already made by the most successful engineers when stowing the fruit in the holds, whether the installation is battery and air-circulation or the grid system. An excess of as much as 12½ per cent. of the stowage space is given up to provide ample access for the cool air through all parts of the cargo, and this no doubt is one of the reasons why the rate of freight is higher than it ought to be. Last season it was 6s. per case (12½ per cent. of which equals 9d.). In other words, were it not for leaving this abnormal space between packages, 12½ per cent. more fruit could be stowed, and a corresponding reduction in freight would pay ship-owners as well. Under present shipping conditions, when placing warm fruit straight into the holds, it is essential to stow in the manner indicated, whilst it would not be necessary to anything like that extent if all the fruit were pre-cooled prior to shipment.

If the fruit were received at cool stores on land and packed into chambers at the same temperatures, in large quantities, and in the same manner as on board ship, the results would be no better. Engineers cannot perform impossibilities. When given a large hold of hot fruit they can only do their best, and even then the outcome will be unsatisfactory to all concerned. The varieties of fruit shipped are kept successfully in cool stores in Victoria for much longer periods than is necessary on the voyage to the United Kingdom.

Recommendation.

As shippers are now negotiating for the next season's service, I recommend the Victorian exporters to as far as possible secure separate holds in steamers for Victorian fruit alone. The shippers can then arrange to pre-cool all fruit for such reserved chambers. Resolutions carried at various meetings indicate that all concerned are in favour of proper experiments in order to confirm the advantages of the system. These cannot be satisfactorily carried out on land in small chambers. A large chamber to hold at least 10,000 cases would be required, and the question arises as to who would provide such a quantity of fruit.

As facilities for pre-cooling are not available in all the fruit exporting States, it will be necessary, when stowing, to arrange for the provision of ample room for the circulation of air through all parts of the cargo. The larger the holds, the greater the space necessary for air circulation. In all vessels fitted with pipe grids adequate means should be provided for the circulation of the cool air.

Each and every refrigerated steamer should be fitted with long-distance thermometers or thermographs, or both, so that the refrigerating engineers can be in constant touch with the hold temperatures. In the case of large holds, two or more points would be advisable.

ELMORE CROP AND FALLOW COMPETITIONS, 1922.

Report of the Judge (H. A. Mullett, B. Ag. Sc., Chief Field Officer).

The Elmore Agricultural Society is to be congratulated on having restored the Crop and Fallow Competitions to its prize schedule. The original Competitions lapsed in 1910. Had they been continued regularly to the present time, there is no doubt that a fund of valuable practical information on the best methods of wheat-growing in the district would have been accumulated and distributed boardcast. As it is, the society has the task still in front of it, but a satisfactory commencement has been made this year.

The present report is concerned solely with the crop competition, it having been decided to judge the fallows next March. In all, nineteen crops were submitted for inspection. The following progressive wheat-growing centres in the Campaspe Valley were represented:—Elmore, Avonmore, Runnymede, Corop, Hunter, and Egerton. The visit enabled a critical estimate to be made of the productive capacity of the various classes of soil and of the skill of the individual farmers. But the dry season passed a judgment on the merits of the methods of crop production more accurately than that of any professional agriculturalist.

In short, the well-farmed land produced heavy crops, despite the dry season, but the crops on neglected fallow, or where grown without fallow, were poor. The outstanding lesson of the competition, then, is that it pays to farm carefully. Impressive were the differences between the yields of the best and the worst crops noticed, and great is the task before the Elmore society in its newly-awakened endeavour to level up the farming methods of the district to the standard of the best in it—that is apart altogether from the need for discovery of improved agricultural methods by means of properly conducted experiments which the Elmore society should foster.

The deep loams of the Runnymede district struck me particularly as being highly fertile and naturally productive, without the use of great skill, and readily capable of growing tremendously heavy crops under proper treatment All the other land of the district, too, is likely to be responsive to the use of improved methods, if not quite to the same degree.

Results.

Mr. T. E. Houlden. of Runnymede, was awarded 97 points and first place for a heavy crop of Graham wheat. The crop was remarkably heavy for the year, dense and regular throughout, level on top, clean underfoot, and comparatively free from foreign varieties and disease.

Alongside, on the same farm, an equally heavy paddock of Federation was noticed. The excellence of the winning crop is undoubtedly due to the judgment and care with which the fallow on which the crop was grown had been ploughed and subsequently tended. The land was thoroughly ploughed to 5 inches deep in July and early August, and then harrowed after rain. Mr. Houlden finds that he is unable to obtain a satisfactory "comb" to harrow down unless his particular soil is ploughed to the depth mentioned. In October the paddock was spring-toothed, comparatively shallowly, and in November scarified. It remained thus until the following May, when it was rescarified and drilled. The wheat was sown early in May, after rain, with 65 lbs. of seed per acre and 70 lbs. of superphosphate. The soil was a good red loam overlying clay.

Messrs. B. Dobell and T. Hayes, on the fringe of the Corop District, obtained 92 marks and second place. The variety was Federation, and the soil red clay loam overlying retentive clay. The crop was a heavy one, clean, free from any disease, and was very even. A few foreign heads were noticed.

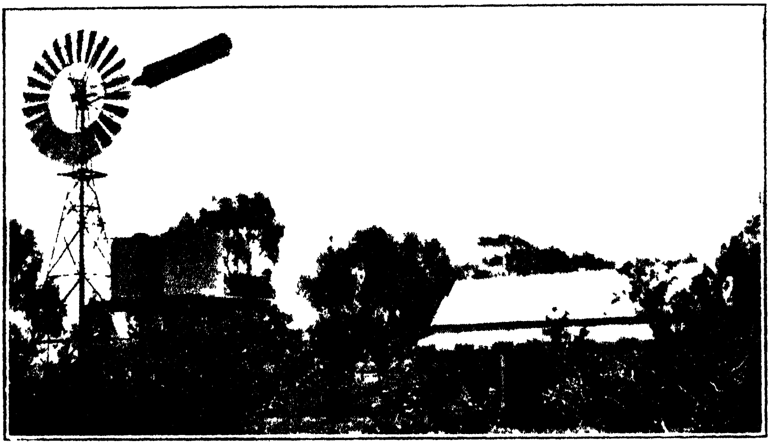
The land, shallower than that at Runnymede, was fallowed in July and early August to 4 inches deep. It was harrowed immediately afterwards. In March it was scarified, in early May spring-toothed, and then drilled and harrowed during the second week of that month. Seventy-five lbs. of seed per acre was used, with 85 lbs. superphosphate. The rainfall in this locality appeared to have been somewhat heavier than that received nearer Elmore.

Residence of Mr. A. R. Goldie on the Campaspe River, Elmore.

Mr. A. R. Goldie's entry was a heavy crop of Major wheat, grown on a rich black flat bordering the Campaspe River, in the shire of Waranga. Eighty-nine marks were awarded. The crop was tall, dense, and even, but points were deducted for the presence of foreign heads and a few weeds.

The land was fallowed in July to 4 inches deep, harrowed immediately after ploughing, and then disced twice in the spring. Subsequently, it was disced prior to drilling, which took place towards the end of May. Eighty lbs. of wheat per acre were used and 40 lbs. superphosphate.

Other heavy crops were exhibited by Messrs. H. J. Carmody, R. J. Roulston, D. J. Murphy, C. Cunneen, and E. C. Rasmussen. Mr. Carmody's crop of Federation was quite free from weeds, and was characterized by short straw and level top. The fallow upon which it was grown was ploughed early in July and August to 4 inches deep, then harrowed. In the spring it was twice spring-toothed while weeds were young. Subsequently, it was spring-toothed in front of the drill in mid-June, and then harrowed. Seventy-five lbs. of seed per acre was applied, with a liberal dressing of superphosphate—90 lbs. Points were deducted for the presence of foreign varieties.



Residence of Mr. R. J. Roulston, Elmore.

Residence of Mr. D. J. Murphy, Elmore.

An equally heavy crop was that of Mr. R. J. Roulston. The fallow was well worked and sown with a combined spring-toothed cultivator-drill. Sixty-five lbs. of seed, with 96 lbs. of superphosphate, were used per acre.

Mr. D. J. Murphy's crop of Federation was one of the heaviest seen. It lost points because of the presence of wild oats. The seed, having been obtained from the Longerenong College direct, was comparatively free from foreign heads.

Mr. C. Cunneen's crop was sown on early-ploughed fallow, with 70 lbs. of Federation wheat, and from 90 to 112 lbs. of superphosphate per acre.

Mr. E. C. Rasmussen's Major wheat lost points because of the presence of wild oats and strangers. It was sown at the end of April. Seed at the rate of 70 lbs. per acre, with 1 cwt. of superphosphate was used.

On land somewhat more clayey in character, Mr. J. W. Smith had a short, dense, and pure crop of Federation.

The remaining crops, many of them, though creditable, were lighter in yield. The principal scores on which marks had to be deducted were the presence of foreign heads, noxious weeds, wild oats, and ball smut. Where this latter disease was noticed the penalty was made heavy because it is one that pickling in correct fashion can entirely eradicate.

Details of Awards—Crop Competition, Elmore, 1922.

WHEAT

Competitor	Variety.	Yield.	Trueness to Type	Absence of Weeds	Absence of Disease.	Evenness	Total
Possible Points	. ..	**35**	**20**	**15**	**15**	**15**	**100**
T. E. Houlden	Graham	35	19	14	14	15	97
B. Dobell and T. Hayes	Federation .	31	18	14	14	15	92
A. R. Goldie (No. 2)	Major	34	14	13	14	14	89
H. F. Carmody	Federation	28	15	14	15	15	87
R. J. Roulston	Federation	28	17	15	14	13	87
J. W. Smith	Federation	26	19	13	14	15	87
D. J. Murphy	Federation .	31	19	10	12	13	85
C. Cunneen .	Federation	28	14	9	14	14	79
D. H. Adams and Sons	Federation .	22	19	13	11	13	78
E. C. Rasmussen .	Major .	27	15	9	14	12	77
A. R. Goldie (No. 1)	Federation .	24	15	13	11	13	76
R. H. Kerr ..	Major ..	26	18	10	10	12	76
H. O. Streckfuss .	Yandilla King	25	16	14	9	11	75
A. Dobell and Wright	Federation ..	25	18	7	11	13	74
Dutton and Young	Steinwedel ..	22	19	12	7	14	74
Henry Smith	Federation ..	23	16	13	8	13	73
R. Dutton .	Federation and Currawa	19	15	14	10	13	71
A. W. Bailey .	Federation and Gallipoli	21	15	12	11	10	69
L. Strawhorn .	Federation ..	19	17	13	9	11	69

NOTE.—The points for yield represent rather less than 1 point for each bushel per acre. The winning crop was estimated to yield about 12 bags per acre.

Summarizing the Results.

The results of the competition appear to emphasize the value on loamy land in this district of thoroughly tilled fallow as a fundamental preparation for a heavy yielding wheat crop. The heaviest crops this year have been grown in general on fallow which was carefully and deeply ploughed early in the winter, and subsequently well cultivated in the spring and again in the autumn. Where the crops were light, there the minimum of cultivation had been given. Again, there are strong grounds for believing that it pays to grow varieties of wheat which have been subjected to continuous improvement such as is given at the

Government seed stations, and further that it is profitable to fertilize the crop liberally. On the whole the fallow in the district is tilled far less thoroughly than is found profitable for corresponding soils in the Wimmera.

Wheat-Growing at Elmore—Fallowed and Non-Fallowed Crops.

Three main soil types were noticed at Elmore—rich free-working red loams as at Runnymede, occasionally shading off into black flats in the direction of Colbinabbin; shallow clay loams west of the Campaspe River; and more or less refractory soils in the direction of Corop, and again at Edgerton. Each soil requires its own special treatment if best results are to be obtained with wheat. Rich or poor, they must all be carefully fallowed. The non-fallow crop, long abandoned in the Wimmera, is still persisted in for portion of the wheat sown on many farms in the Northern District, which includes the Goulburn and Campaspe Valleys. Sometimes the practice flatters farmers, but on the average it leaves them poorer in pocket than if the whole or even a lesser area of the crop had been sown on systematically prepared fallow.

A Heavy Crop of Federation Wheat (Mr. R. J. Roulston's).

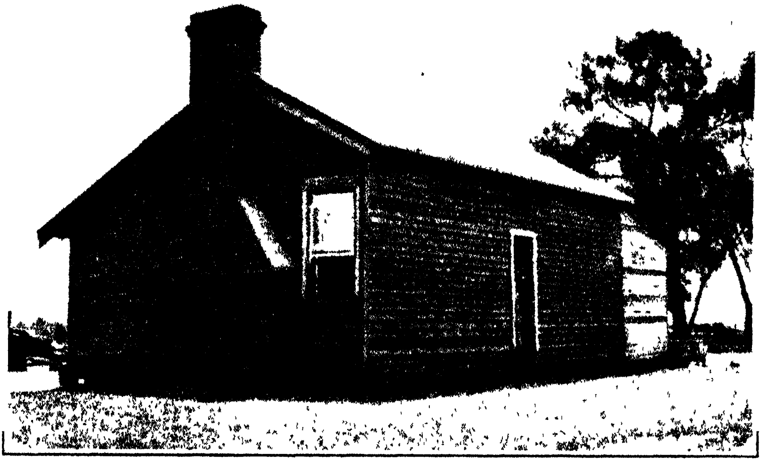
The non-fallowed crop, besides giving relatively lower returns, may cause a reduction of the yield of the crop on fallowed land, but in such an insidious fashion as to escape notice.

Ploughing is the slowest cultural operation on the farm. The delays caused by ploughing up land immediately prior to sowing inevitably lead to an unduly protracted seeding period, which means reduced yields. Again, a lengthened seeding season may lead to a late commencement of the fallowing for next years' crop, and here also reduced yields.

Of the value of early fallow there can be no doubt. A careful comparison of the yields of the various crops at Elmore with the time they were fallowed shows that the early fallowed crops are markedly superior, and that deduction is again backed up by the results of the cultivation tests at the Rutherglen Experiment Farm in the North-East. July fallow over a seven years' period there is superior to September or October fallow. Some farmers at Elmore regularly get the fallowing done in July and early August, and there is no reason why every one on well-drained land should not make a special effort to do the same.

Depth of Ploughing.

In the Wimmera, on the friable soils so notoriously difficult to compact properly, it is fatal to high yields to plough deeper than from 3½ to 4 inches except in a wet year. But at Elmore, on the clay loam at any rate, the position is different. The annual rainfall is heavier than that in the Wimmera, and the soil packs down on old land much more readily.

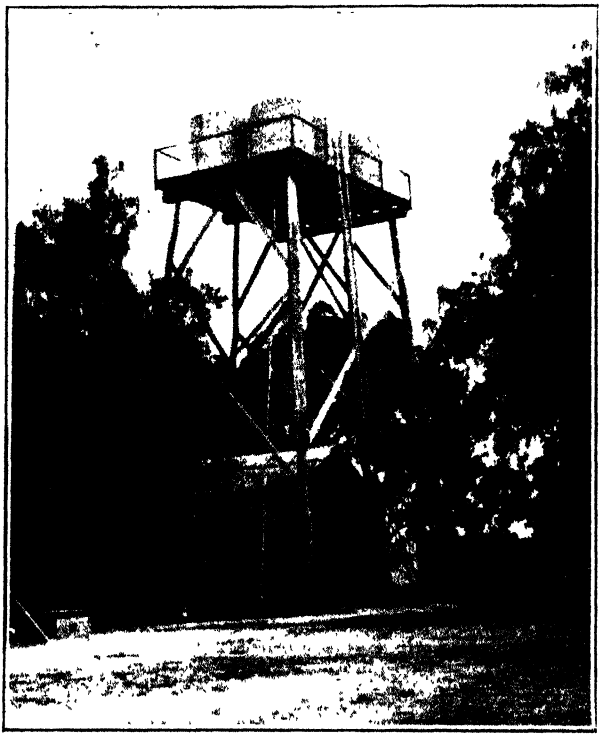


Home of a Repatriated Soldier (Mr. Henry Smith) at Hunter.

Mr. Henry Smith's Wheat Crop.

It is probable that for July fallow the most profitable depth to plough is 5 inches if the soil be deep enough. The results of the Rutherglen cultivation tests lend support to this view. But when fallowing is delayed till September or October, there does not seem the same justification for reaching such a depth, because, owing to the shorter season and the reduced quantity of rain likely to fall on it, there is some difficulty, even at Elmore, in securing the necessary compaction of the under layers. For October fallow from 3½ to 4 inches may be quite sufficient.

Of course, it is understood that in no case should quantities of the subsoil be brought to the surface. In the Wimmera, however, there are instances of shrewd farmers, finding the soil at 5 inches rich in marl, who have occasionally ploughed deep enough to bring a little to the surface for the purpose of improving the texture and fertility of the upper layers where these were likely to benefit.



Tank-stand, 40-feet high, at Mr. A. R. Goldie's, Elmore.

It has often been suggested that subsoiling, say, to 18 inches, would pay in the Goulburn Valley, but the experience at Rutherglen on soils approximately similar definitely proves that for wheat no benefit whatever results, and therefore that the practice would result in considerable loss.

Working the Fallow.

The treating of more refractory clayey soils will be dealt with in the report of the crop and fallow competition to be furnished by the Shepparton Agricultural Society. In the meantime, the loamy soils may be referred to here. The treatment of a fallow for best results involves something more—much more—than the killing of weeds and the convenient preparation of a seed bed for the ready germination of wheat. For maximum yields it is important to trap and store moisture in the under layers of the soil over the summer months, and to facilitate the rapid formation of soluble plant food in the soil. The soil quickly loses its moisture if allowed to set firm on top, but the evaporation may be considerably reduced if there is a layer of loose soil some 2½ inches deep on top. A warm moist soil is an active soil. It is one on which weeds germinate readily, and may thus be removed by cultivation, and in particular it is one in which bacterial life and the process of convertion of inert soil particles into soluble plant food is most active. But considerable skill is required in creating and maintaining the layer of loose soil, technically termed the mulch. The fallow should as far as possible be worked in a moist condition, if it is to assume a proper porous texture, of which a certain mellowness readily visible to the practical man is an unfailing characteristic.

Fat Cattle on the Fertile Campaspe Flats at Mr. A. R. Goldie's, Elmore.

Again, while wheat requires a shallow loose soil to germinate in, it must have a firm consolidated under layer for its roots to penetrate if growth is to continue satisfactorily. The ideal fallow on loamy land when viewed in November is one having about two and a half inches of loose mellow soil overlying a firm, moist, level layer of under-soil, previously ploughed to a greater depth but since consolidated.

These desiderata can be secured where the land is fallowed early, then harrowed down immediately it works freely. Subsequent cultivations must be made to a carefully regulated depth which is no greater than 2½ inches. The use of implements with which this cannot be maintained should be avoided where possible. Working the soil when dry should be avoided. The disc, so effective on refractory land and where weeds are bad, cannot be regulated to cut to a shallow depth. The spring-tooth, useful to kill weeds while young and to till the surface, is not of service where the soil contains hard patches. Some implement between the two mentioned is required for the Goulburn Valley loams. Two that suggest themselves are the Wimmera scarifier, not the usual type of scarifier seen in the district, and the rigid-tined cultivator. The Wimmera scarifier should be invaluable in some sticky black flats seen in the district, and it should be useful also on the red loams. It is an effective weed killer, and an implement with which a firm bottom can be readily created and maintained. A public trial of both these implements should be arranged by interested agricultural societies.

The questions of pickling wheat, wheat varieties, and manurial treatment will be referred to in reports of competition in other districts to be published later.

A WHOLESALE RAT TRAP.

The method of destroying rats described hereunder has been clipped from a Sydney paper:—

Get an old tub, take away the top, and supply its place with parchment or stout brown paper. On this for two or three nights in succession leave a few fragments of cheese, bacon, or other dainty dear to the rat palate. Lean a piece of board against the side of the tub to serve as a ladder, and allow the rats to become thoroughly accustomed to the future trap. After a few days place a brick upright at the bottom of the tub, fill with water to a depth of 6 inches so that the top of the brick is just high and dry, and cut the parchment in slips in such a manner as to give way at the slightest pressure. The first rat that ventures on this falls, of course, into the water, and quickly makes its way to the brick; so does the second; and then ensues a battle royal, accompanied by much squeaking. Now the cry of a rat in distress invariably attracts every other rat within hearing, with a view to a possible meal upon their unfortunate relations. So others quickly share the fate of the imprisoned rats, and large numbers are thus caught.

PERFORMANCE v. PEDIGREE.

So convinced is the Danish Government of the value of performance as distinct from pedigree, says a recent issue of the Journal of the Ministry of Agriculture (London), that in making provision for the award of special prizes for bulls, it was laid down that a bull is not eligible for a Government prize unless records of the performances of his daughters can be produced. The journal quotes the informative statement that before inauguration of milk-recording societies it had already become a general practice to keep bulls for service for a number of years and to judge the bulls by an examination of their offspring.—*New Zealand Farmers' Advocate.*

STALLION REGISTER 1922-23

under the "Horse Breeding Act 1919."

Part III.—Registrations from 17th August, 1922, to 8th December, 1922.*

Cert. No.	Name	Age.	Class	Owner.	Address
		Yrs			
1537	Abbotsford	A	Draught	McGregor Bros.	Rochester
1431	,, Champion	A	,,	C. Elphick	Foster
1394	Abbot's Pride	A	,,	P Haire	Port Fairy
1337	Abdulla King	A	Pony	E. Stevens	Pranjip
1461	Abutilon	2	Draught	J. Walder and Sons	Watchem
1430	Admiral Moray	A	,,	T. J. Keogh	Jarklan
1535	,, Sperry	A	,,	N. Mathieson	Waitchie
1344	Advance	A	Light	L. C. O. Smith	Merbein
1462	Aiken Flower	2	Draught	J. Walder and Sons	Watchem
1504	Aleconner	A	Thoroughbred	G. A. Fairbairn	Kerrisdale
1463	Altona	6	Light	C. Joiner	Echuca
1334	Ambition II.	A	Thoroughbred	L. J. King	Quambatook
1239	Anchor Boy	3	Pony	J. Black	Winchelsea
1320	Argyle	A	Draught	F. McRae	Wallup
1345	Athlete	5	Pony	J. Lane	Warragul
1376	Aztic	4	Light	E. J. Lehmann	Murrayville
1258	Balnakill	A	Draught	R. J. Thompson	Brim
1220	Banjo	4	Pony	R. Jukes	Maryborough
1514	Baron Alexander	A	Draught	Miller Bros.	Bacchus Marsh
1240	,, David	4	,,	Mrs. Fitzgerald	Allansford
1271	,, Douglas	3	,,	T. Maddern	Blackheath
1221	,, Ettrick	3	,,	C. Hewitt and Sons	Werrigar East
1346	,, of Dalmore	A	,,	Jno. McGregor	Pakenham
1242	,, Prince	3	,,	J. J. Quinn	Elmore
1204	,, Wattee	5	,,	F. Nagorcka	Tarrington
1241	Baron's Pride	4	,,	J. J. Quinn	Elmore
1243	Baron Star	2	,,	R. J. Wilson	Camperdown
1395	Bell Boy	A	Pony	T. Bandy	Waubra
1456	Belmont	2	Draught	J. T. Poynton	Ensay South
1392	,, Chimes	A	Light	C. S. Walker	Swan Hill
1222	Ben Marceline	A	,,	F. A. Cox	Geelong
1373	Benmore	2	Draught	A. E. T. Payne	Lillydale
1424	Best Vale	A	Light	John Cox	Benalla
1432	Billy	6	Pony	G. Howlett	Coburg
1499	Bingen	5	Light	Watts Bros.	Kamarooka
1481	Black Bolt	A	Pony	G. Meek	Kinimakatka
1433	Blackboy	A	Light	F. Stares	Longford
1515	Black Imp	A	Pony	F. M. Orton	Murmungee
1292	,, Knight	4	Light	G. and W. Lord	Flynn
1329	,, Rock	A	Pony	A. Shanks	Lake Mundi
1445	Blacon	A	Draught	J. Phillips	Marcus Hill
1272	Blair's Choice	4	,,	Keam Bros.	Glenlea
1293	Blue Bolt	4	Pony	A. Philip	Nerrin Nerrin
1446	,, Ribbon	A	Draught	D. McGrath	Manangatang
1347	Bobs	3	Pony	J. Long	Woori Yallock
1333	Bold Alex	6	Draught	L. J. King	Quambatook

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* For registrations prior to 17th August, see *Journal* for October and November.

Stallion Register, Part III., 1922–23—*continued.*

Cert. No	Name.	Age Yrs	Class.	Owner	Address
1321	Bold Baron	A	Draught	A. Gillis	Newmarket
1238	,, Douglas	3	,,	Thos. Thornton	Waaia
1460	,, Jock	5	,,	J. Bayliss	Eaglehawk
1294	,, Prince	4	,,	G. Ross	Mt. Prospect
1336	,, Rowan	A	Light	F. B. and M. Bingley	Mt. Mercer
1244	Bolwalla	A	Thoroughbred	Harris and Dunne	Warrnambool
1482	Bonnie Signal	A	Draught	W. H. Barlow	Wanalta
1396	Boro Sportsman	A	,,	E. H. Nolte	Merino
1259	Bramhope Royal William	A	,,	G. Wilson	Talgarno
1423	Brigham Shanter	A	Pony	J. J. Wall	Numurkah
1377	Brigham's Last	A	,,	S. S. Baulch	Orford
1458	Bright Bells	6	Light	S. R. Ritchie	Thomastown
1397	Brydon	A	Draught	G. H. Whykes	Woodside
1416	Buck	A	Pony	Dolman Bros.	Coleraine
1295	Bushlark	A	Light	W. H. Penaluna	Boolarra
1340	Caledor	A	Thoroughbred	W. J. Keys	Pyramid Hill
1296	Canary II.	4	Pony	G. T. Barber	Korweinguboora
1245	Capitalist	6	Draught	A. K. Urquhart	Hexham
1464	Capshot	A	Thoroughbred	J. G. Davidson	Casterton
1516	Carbinet	A	Light	W. Falls	Fish Creek
1218	Carden	A	,,	W. H. Penaluna	Boolarra
1267	Carmichael	A	Draught	J. A. Pearse	Glenrowan W.
1348	Celmar Style	5	Light	W. Cochrane and Sons	Ballarat
1349	Chenard	5	,,	W. T. Carter	Coleraine
1297	Clan Fingon	A	Thoroughbred	Ned's Corner Cov.	Mildura
1418	Cleverland	A	Pony	W. McKenzie	Warracknabeal
1298	Commodore III.	4	,,	E. C. Weir	Newry
1434	Convincer	A	Draught	H. Coleman	Rupanyup
1435	Coral Style	4	,,	J. R. Stokes	Abbotsford
1465	Count Traquair	A	Thoroughbred	T. D. Ryan	Tatura
1429	Craig Derby	2	Draught	A. R. Allan	Broughton
1299	,, Eran	2	,,	Wm. Walter	Tatura
1350	Craigmond	3	,,	A. Kay	Binginwarri
1517	Cross in hand Charmer	A	,,	F. E. Coster	Sarsfield
1500	Crown Derby	A	,,	W. S. Graham	Tongala
1436	Curfew Bells	2	Light	G. H. Alford	Murrumbeena
1351	Cymbrel	4	,,	D. Robbins	Korumburra
1466	Cymro Bar	A	Pony	A. Dunn	Trawalla
1300	Cyndette II.	4	,,	C. G. Newton	Kilmany South
1398	Cyndetto	3	,,	R. Costello	Darriman
1339	Dandy	A	,,	W. J. Phelan	Meeniyan
1425	,, Geordie	A	,,	T. G. McKenzie	Yarram
1301	,, Jim	3	,,	W. G. Thorburn	Boolarra
1302	Danie Bells	4	Light	H. Bechaz	Trafalgar
1447	De Wet	A	Thoroughbred	R. Humphrey	Cudgewa
1246	Dimboola	5	,,	W. Rogers	Warrnambool
1352	Dixie Boodle	A	Light	John Casey	Woodend
1417	Doctor Jack	A	,,	H. Coleman	Rupanyup
1247	Domination	A	Pony	C. T. Lucas	Pomborneit
1223	Donibristle	A	Draught	Trustees of J. G. Wilson	Milawa
1467	Drumore	A	Thoroughbred	John McPhee	Merino
1225	Duke	A	Draught	E. A. Thornley	Hawkesdale
1205	Dumaresq	3	Thoroughbred	A. V. Hiskens	Moonee Ponds

STALLION REGISTER, PART III., 1922–23—*continued.*

Cert. No	Name	Age	Class	Owner	Address
		Yrs			
1303	Duncan Stewart ..	5	Draught .	J. Fitzpatrick ..	Heyfield
1353	Dunmore's Pride	3	,, .	W. Jones ..	Warrenheip
1304	Earlsan ..	A	Thoroughbred	H. Maguire .	Stratford
1206	Eaton Headlight	4	Draught ..	E. W. Schneider	Yulecart
1207	Eaton's Pride ..	2	,, .	G. Gray ..	Branxholme
1393	Eltham .. .	A	Light	G. Gill	Gre Gre Village
1526	Erigator .. .	A	Draught	R. Whinfield	Bamawm
1273	Ethelred of Bolobek	3	,,	R. Watson	Digger's Rest
1483	Ettrick ..	A	,,	A. J. Gordon	Violet Town
1419	Ettrickdale	A	Pony .	W. H. Barber .	Wodonga
1484	Euphorion	A	Thoroughbred	P. Travis	Chiltern
1437	Excelsior .	6	Light ..	Mrs. P. Shipp	Richmond
1270	Eve Glass	A	Thoroughbred	W. B. Cumming	Camperdown
1274	Factotum	3	Draught ..	G. Buckley	Wickliffe
1305	Firebrick ..	A	Light .	H. Campbell	Traralgon
1275	Fitzallan's Model	2	Draught	A. E. Male	Glenthompson
1306	Flashwood	5	Light	R. Elvis	Korweinguboora
1399	Flying Star	A	..	O. Martin	Leongatha
1438	Footwork . .	4	..	Jno. Chapman	Ouyen
1354	Foreman .	4	Draught	E. Morton	Drouin
1523	Gay Garland .	A	,,	F. McCrae	St. Albans
1260	Galtimore .	A	Light .	F. D. O'Connell	Omeo
1525	General ..	A	Pony	R. Lewis	Fawkner
1507	,, Foch .	6	Draught .	Ferguson Bros	Swan Hill
1532	,, Gordon .	3	Light .	Sharp and Taylor	Glenaroua
1439	Glendale	5	Draught .	R. C. Gulliver .	Balldale, N.S.W.
1478	Glengarnock .	A	,, ..	B. McKenzie	Bass
1355	Glyn Lloyd ..	3	Light ..	J. J. Love .	South Morang
1401	Glynne Loch ..	6	,,	R. Costello	Gifford P.O.
1506	Glynngariff	5	Pony ..	W. C. Morrison .	Traralgon
1440	Gold Dust ..	A	Light ..	Mrs. M. Birss .	Stradbroke
1492	Gold Mauritius ..	4	,, ..	C. Potts	Murrumbeena
1402	Gwalia Caesar ..	A	Pony .	A. E. Hoadley	South Melbourne
1527	Hampton Ben .	A	Draught	P. Zealander	Warracknabeal
1356	Hampton's Lad ..	2	,, ..	J. McGuinness .	Leongatha
1403	Happy Binnia .	A	Light ..	E. H. Nolte	Merino
1374	Herdsman's Treasure	3	Draught	W. J. Cobbledick	Undera
1448	Highland Laddie	A	,, ..	P. O'Keefe ..	Laceby West
1308	Hillhead Chief ..	2	,, ..	T. H. Peters .	Lake Bolac
1449	His Majesty .	A	,, ..	T. J. Burt ..	Cowwarr
1378	Homeward Bound .	3	Light ..	McCamey and Coto	Tinamba
1400	Honey King ..	A	,, ..	O'Loughlin Bros.	Leongatha
1309	Hover-a-Blink .	4	Draught ..	J. B. Ferguson ..	Waubra
1310	Humoresque ..	4	Pony ..	A. C. Bayley ..	Willaura
1404	Jack McKinney ..	A	Light ..	D. Moriarty ..	Wee-wee-rup
1468	,, Newton ..	2	Draught ..	T. Healy ..	Kamarooka
1276	,, Southerton .	2	Light ..	G. George ..	Beaufort
1518	Jet	A	Pony ..	D. H. McConnell	Longford
1261	Jock McCraw ..	6	Draught ..	Williamson and Coghill	Wendouree
1277	John Douglas ..	5	,, ..	V. P. Dahlenburg	Winiam
1469	Jubit	A	Light ..	P. J. Kelly ..	Hinnomunjie
1519	Junot	A	Thoroughbred	N. McDonald ..	Purnim

STALLION REGISTER, PART III., 1922-23—*continued.*

Cert. No.	Name.	Age	Class.	Owner.	Address.
		Yrs.			
1358	Justice	4	Draught	Sir Rupert T. H. Clarke	"Bolinda Vale," Lancefield Junction
1405	Kelso	A	"	Carty Bros.	Nandaly
1470	Keyver	3	Thoroughbred	W. Lang	Mitiamo
1209	Khamasin	5	Light	S. Winter Cooke	Hamilton
1224	King Edward	A	Draught	J. G. Wilson	Milawa
1459	" Jimmy	A	"	J. Henderson	Leongatha
1541	" John	3	"	A. Cail	Kamarooka
1441	King's Own	A	"	John Denham	Leongatha
1538	Kintyre	A	Light	McGregor Bros.	Rochester
1471	Larrakin	4	"	F. A. Rigby	Box 7, Walpeup
1359	Latest Fashion	A	Draught	F. W. Benson	Tarwin Lower
1311	Left Bower	5	Light	C. J. Piffero	Whitfield
1502	Leitch	A	Pony	Ferguson Bros.	Coleraine
1539	Little Joe	A	"	T. & J. McNamara	Omeo
1491	" Mac	3	"	E. C. Henry	Berwick
1493	Llang Graeme (imp.)	A	Thoroughbred	O'Brien and Johnston	Cowwarr
1360	Lochaber	4	Light	W. Cochrane and Sons	Pootilla
1227	Locksley	A	Draught	C. F. Schulze	Arkona
1534	Lodestar II.	3	Light	A. McKinnon	Briagolong
1485	Lord Lonsdale	A	Pony	D. G. Tomkins	Coleraine
1509	" Panic	A	Light	D. J. Hamer	Croydon
1497	" Trentham	A	Draught	C. Maher	Tatura
1520	Lucknow	2	"	A. Strawhorn	Barfold
1262	Lucky Charm	A	"	D. Williamson	Wendouree
1278	Mac's Fancy II.	3	"	A. C. Jorgensen	Katyil
1216	Magic Railway	3	Pony	Jessie Wilkin	South Yarra
1279	Major Again	5	Draught	H. M. Bywater	Balrootan N.
1280	" Grattan	2	Light	R. N. Keating	Antwerp
1228	Maldon	A	Pony	J. E. Sage	Somerville
1380	Malt Change	A	Thoroughbred	J. M. O'Connor	Buchan
1312	Maltstead	5	Light	E. J. Wright	Gormandale
1479	Marama	2	"	E. A. McRae	Buchan
1370	Mark	3	Draught	J. Curran	Traralgon
1486	Marquis Bold	2	"	W. Forbes	Berwick
1381	Master McKinney	A	Light	J. W. Keirce	Buckrabanyule
1406	Mawallok	3	Pony	G. A. Fairbairn	Kerrisdale
1248	McKinney Star	5	Light	Noel Bros.	Terang
1487	Menin (imp.)	A	Thoroughbred	H. Alan Currie	Burrumbeet
1281	Merri King	3	Light	L. F. Etherton	Broughton
1291	Metal Bells	4	"	A. Gillis	Newmarket
1472	Mick	A	Pony	H. Foster	Red Cap
1513	Mimetic	A	Light	A. E. Pegler	Mildura
1473	Model's Herod	3	Draught	M. Hutcheson	Pine Grove
1531	Monk	A	Pony	R. Angus	Springvale
1313	Montrae Bold	5	Draught	E. Don	Newham
1215	Moredun Hero	3	"	J. R. Mitchell	Sandford
1214	" Ranger	2	"	J. R. Mitchell	Sandford
1455	Moro Huon	A	Light	H. E. Fisk	Leongatha
1382	Musko	A	Thoroughbred	W. Studman	Lucknow
1361	Narahquong	A	"	H. Garner	Yan Yean
1407	Native Prince	A	Draught	R. McKenzie	Woodford
1422	Newton Bold	A	"	L. J. King	Quambatook
1442	Newton's Pride	4	"	H. E. Cuttle	Ultima

STALLION REGISTER, PART III., 1922-23—*continued.*

Cert No	Name	Age Yrs	Class.	Owner	Address
1210	Noble Glen	2	Draught	W. Nagorcka	Tarrington
1362	Nutshell	4	Pony	A. M. Greenfield	Ballarat
1375	Ormond	2	,,	D. Rumpf	Herne Hill
1229	,, Dale	A	Draught	Letcher Bros.	Donald
1322	Oyama	A	Light	A. E. Kay	Dean
1282	Palm Leaf	2	,,	J. A. Dalgleish	Stavely
1474	Patrician	2	Draught	R. and A. McClelland	Lara
1524	Peter	A	Pony	A. J. Missen	Woodside
1536	Peter	A	,,	J. Abrahams	Fitzroy
1480	Pharaoh	3	Light	J. D. Patterson	Officer
1331	Ploughboy	A	Draught	P. Donovan	Learmonth
1475	Plucky Willie	2	,,	W. E. Dahlenburg	Pimpinio
1283	Poilu	A	Pony	D. L. Goodwin	Kaniva
1330	Preble	5	,,	A. F. McKenzie	Hexham
1230	Premier Darnley	A	Draught	Sham Singh	Tempy
1249	Prince Baron	3	,,	Geo. Crabbe	Colac
1314	,, Bellinda	A	Light	O. Lock	Thorpdale
1290	,, Denver	A	,,	H. Bambridge	Northcote
1323	,, of Lorne	A	Draught	E. H. P. Young	Congupna Road
1450	Principal	A	Light	J. Kosch	Byaduk
1408	Punter	A	Pony	R. Ready	Rutherglen
1363	Quality	5	,,	A. E. Callow	Ballarat
1420	Queen's First	A	Draught	Kenyon Bros.	Lascelles
1315	Raeburn	3	,,	E. J. Fowler	Anakie
1250	Red Lion	5	Pony	G. H. Whitehead	Minhamite
1251	Referendum	A	Draught	C. Dew	Ferguson
1341	Remus	A	Pony	F. O'Byrne	Byrneville
1328	Report	6	Light	S. Fraser and Sons	Melbourne
1540	Right Royal	A	Thoroughbred	John McKinnon	Kongwak
1533	River Bells	A	Light	Joe Byrne	Toora North
1488	Rizzio (imp.)	6	Thoroughbred	H. Alan Currie	Burrumbeet
1211	Roala	3	Pony	B. E. Lyon	Coleraine
1316	Robin	3	Draught	R. Geddes	Lake Bolac
1409	Robin's Pride	A	Light	A. W. Dawson	Meerlieu
1490	Rocket	A	Pony	R. M. Whelan	Apollo Bay
1501	Roseneath Prestige	2	Draught	J. J. Vile	Moorwatha, N.S.W.
1231	Royal Bill	4	,,	W. J. Collins	Beulah
1410	,, Derby	4	Light	G. H. Eastaugh	Auburn
1237	,, Ensign	3	Draught	A. Gillis	Newmarket
1263	,, Fashion	4	,,	A. J. D. McRae	Gre Gre North
1252	,, Prince	4	,,	J. J. Gleeson	Southern Cross
1508	,, Reserve	A	Light	W. M. Vale	Yarram
1324	,, Ribbon	A	Draught	Jas. Morris	Piangil
1264	,, Salute	A	,,	T. Opie	Deer Park
1428	,, Success	A	,,	W. Elsom	Dart Dart
1383	Royalty	6	Pony	W. Coe	Coleraine
1489	Rysharold	A	,,	A. H. Hunt	Lancefield
1284	Sandy's Fashion	3	Draught	E. Haines	Gerung
1327	Santa Claus	2	Pony	W. Henderson	Grasmere
1253	Scotland's Fancy	A	Draught	Alexander Bros.	Carlisle River
1285	Scotland's Viceroy's First	A	,,	P. B. Miller	Katyil
1503	Scotland Yet	A	,,	E. A. Riether	Balliang
1528	Seabound	A	Thoroughbred	G. J. McVean	Thougla
1335	Sea Voyage	5	Light	K. Noonan	Redesdale

STALLION REGISTER, PART III., 1922-23—*continued.*

Cert. No	Name	Age	Class	Owner.	Address.
		Yrs.			
1510	Shanter's Best	3	Draught	R. H. Thomson	Kyneton
1232	,, Ghost	A	Pony	A. E. Cutche	Clear Lake
1286	Shepherd Jack	3	Draught	Jenz Bros.	Antwerp
1212	Shepherd's Pride	3	,,	E. J. Black	Dunrobin
1384	Shetland Laddie	3	Pony	W. B. Irvine	Nicholson
1426	Siam	A	Light	J. W. Smith	Elmore
1521	Silver Cup	A	Draught	J. McLeod	Tongala
1317	Sir Bute	5	,,	Clyne Bros.	Tinamba
1386	,, Everest	5	,,	A. Ralston	Lucknow
1342	,, Hambletonian	A	Light	J. H. Uren	Kerang
1343	,, Northcote	3	Draught	Geo Madden	Batesford
1287	,, Soulander	A	,,	F. H. Jolly	Gerang Gerung
1411	Speculation	5	Light	D. F. Bourke and W. Quinn	Rochester
1269	St. Patrick	A	,,	A. Shebler	Melton
1332	Strathroy	A	Draught	W. G. Ballintine	Cosgrove
1511	Sunray	3	Pony	W. C. Dettmann	Kyneton
1368	Sunstar	A	,,	J. T. Unwin	Spring Vale
1412	Swimming Belt	A	Light	W. T. Cox	Moolort
1451	Sydney Derby	A	,,	W. Maloney	Mooroopna
1505	Taffy	A	Pony	J. D. Moran	Dunkeld
1364	Texas Huon	4	Light	Jas. Calnin	Alfredton
1201	The Butler	A	,,	Helwig Bros.	Glenlea
1387	,, Colonel	3	Draught	McDonald Bros.	Mortlake
1444	,, General	A	Light	D. J. Kendall	Footscray
1289	,, Link	A	Draught	H. E. Taylor	Nullawil
1498	,, Parisian	3	Light	H. Lidgett	Myrniong
1265	,, Premier	A	Draught	John Roberts	Kunat
1452	,, Roster	3	Light	A. Rodgers	Horsham
1476	,, Vanquisher	A	Thoroughbred	G. W. Horne	Yendon
1365	,, Voyager	4	Light	A. Magill and Syndicate	Wendouree
1369	,, Yarra Chief	A	Pony	J. Douthie	Woori Yallock
1413	Thornstone	3	Thoroughbred	C. Hoysted	Glenrowan
1288	Tigo	3	Pony	J. Graham	Ararat
1366	Tinylights	3	,,	Miss Z. L. Small	French Island
1421	Tinytown	6	,,	Jack Deane	North Essendon
1202	Titiroa Baron	A	Draught	A. Courboules	Cape Clear
1453	Togo's Chief	A	,,	Jno Heffernan	Konongwootong
1522	Tom Almost	A	Light	W. Merrigan	Swanpool
1226	,, Pepper	A	Pony	E. A. Thornley	Hawkesdale
1457	,, Walton	A	Draught	F. W. Sallman	Dimboola
1254	Tommy Dodd	3	Pony	Boyd Bros.	Minhamite
1219	Trelawney Time	A	Draught	R. H. Larcombe	Mt. Moriac
1338	True Blue	3	,,	C. S. Maddern	Kaniva
1512	T. T.	A	Thoroughbred	C. Thompson	Mildura
1255	Unit	4	Pony	B. Rogers	Mepunga East
1217	Vallee Direct	6	Light	Jno. Pretty	Glenhuntly
1233	Valmond	A	,,	A. Judge	Natya
1454	Venture	A	Pony	L. E. King	Violet Town
1388	Vin Direct	5	Light	D. Kennedy	Albert Park
1325	Volunteer	A	Pony	T. B. Waters	Corryong
1494	Von Atom II	A	,,	J. A. Padgett	Berrybank
1427	,, Osterley	A	Light	R. Forrest	Cowes, Phillip Island
1256	Warrigal	A	Pony	S. S. Baulch	Orford
1213	Wee Key	3	,,	R. Kirkwood	Byaduk North

STALLION REGISTER, PART III., 1922-23—*continued.*

Cert. No	Name.	Age.	Class	Owner.	Address.
		Yrs			
1529	Wee McGregor	5	Pony	J. T. Laidlaw	Chetwynd
1266	Welcome Lock	A	Light	J. L. Meagher	Moyhu
1367	Welsh Sovereign	3	,,	J. Dickinson	South Dudley
1234	Wenba	A	Pony	Jno. O'Keefe	Winslow
1257	Whip Voyage	3	Light	Jno. Peters	Cobden
1477	Widgiewa Belmont	2	Draught	C. H. Perkins	Rainbow
1414	William Direct	4	Light	S. Richards	Nerrina
1235	Wotan	A	Thoroughbred	Dickinson Bros.	Sebastopol
1203	W. W. Estell	A	Light	J. Hannah	Donald
1443	Yet Again	A	Pony	Joseph Beard	Terang
1318	Young Buchlyvie	2	Draught	J. H. Hamilton	Stanhope
1391	,, Clydeside	A	,,	W. Fozard	Bendigo
1496	,, Dandy's Pride	A	Pony	J. W. Powell	Beeac
1415	,, Flashlight	A	Draught	J. J. Norman	Bairnsdale
1319	,, Lymm Champion	3	,,	W. H. Penaluna	Boolarra
1326	,, McLeish	A	,,	Jas. Charlton	Stony Creek
1389	,, Nobby	A	Pony	L. Durling	Powlett River
1495	,, Prince	A	Draught	W. Splatt	Inverleigh
1236	,, Recruit	A	Pony	E. W. Waters	Echuca East
1371	,, United Prince	A	Draught	W. G. Young	Nerrin
1372	Zolock O	A	Light	D. McLeod	Numurkah
1390	Zone Time	3	Draught	Jno. Gibson	Benambra

ARTIFICIAL FERTILIZERS.

List of Fertilizers Registered Under the Fertilizers Act for the Year 1923.

P. Rankin Scott, Chemist for Agriculture.

What is a Fertilizer?

A fertilizer is defined under the Act to be any material containing nitrogen, phosphoric acid, or potash which has been manufactured, prepared, or produced in any manner for the purpose of fertilizing the soil, or supplying nutriments to the plant.

Registration of Brands.

All manufacturers or importers of fertilizers who intend offering for sale any such material as above described shall, on or before the first day of November in each year, make application to the Director of Agriculture for the registration of a brand in respect to any such fertilizer. Every such application shall set forth—

(*a*) The full name and place of business of the applicant.

(*b*) The figure, trade mark, or other sign to be attached to or associated with the fertilizer.

(*c*) A statement of the results of a chemical analysis, stating the proportion per centum in which the fertilizer contains the three ingredients, and the respective forms in which they occur.

(*d*) The retail price per ton of the fertilizer.

Unit Value.

Unit value is the value of 1 per cent. of nitrogen, phosphoric acid, or potash in 1 ton of a fertilizer.

From the results of the analyses of fertilizers as set forth in the application for the registration of brands, and taking into account the constituents which have a commercial value, and the value thereof in the simple fertilizers in which they occur, the average unit values shall be calculated. Simple fertilizers are those having a definite chemical composition and those of animal origin such as blood and bonedust.

The unit values are useful for comparative purposes, and offer some guide to the buyer in arriving at the commercial value of any of the fertilizers. Upon the sale of any fertilizer the vendor is required to give to the purchaser an invoice certificate stating the analysis of the fertilizer, which should correspond to the analysis on the label attached to the bag. With the aid of either and the unit value calculated for the respective form of the ingredients stated, the commercial value can be calculated by multiplying the percentage of the ingredient by the unit value for same. The following typical examples will illustrate the principle to be followed:—

SUPERPHOSPHATE.

Analysis.		Unit Value.				
		s.	d.	£	s.	d.
Phosphoric Acid, Water Soluble...	17.00%	× 6	0	= 5	2	0
Phosphoric Acid, Citrate Soluble	0.50%	× 5	0	= 0	2	6
Phosphoric Acid, Citrate Insoluble	0.50%	× 1	0	= 0	0	6
Total	18.00%					
Value per ton				£5	5	0

BONEDUST.

	Analysis.
Nitrogen	3.62%
Phosphoric Acid	21.74%
	Mechanical Condition.
Fine Bone	71.5%
Coarse Bone	28.5%

Nitrogen in fine bone ... $\frac{3.62\% \times 71.5\%}{100} = 2.59\%$

Nitrogen in coarse bone ... $\frac{3.62\% \times 28.5\%}{100} = 1.03\%$

Phosphoric Acid in fine bone ... $\frac{21.74\% \times 71.5\%}{100} = 15.54\%$

Phosphoric Acid in coarse bone ... $\frac{21.74\% \times 28.5\%}{100} = 6.20\%$

			Unit Value. s.	d.		£	s.	d.
Nitrogen as fine bone ...	2.59%	×	24	0	=	3	2	2
Nitrogen as coarse bone ...	1.03%	×	24	0	=	1	4	9
Phosphoric Acid as fine bone	15.54%	×	6	0	=	4	13	3
Phosphoric Acid as coarse bone	6.20%	×	5	0	=	1	11	0
Value per ton						£10	11	2

FERTILIZERS ACT 1915 (No. 2652).—LIST OF UNIT VALUES FOR THE YEAR 1923.

	£	s.	d.
Nitrogen, as Nitrate ..	1	5	10
,, Ammonia	0	17	8
,, Blood ..	1	4	0
,, Blood and Bone ..	1	4	0
,, Bone and Flesh ..	1	4	0
,, in Fine Bone	1	4	0
,, Coarse Bone	1	4	0
Phosphoric Acid—			
Water Soluble ..	0	6	0
Citrate Soluble ..	0	5	0
Citrate Insoluble in the following :—			
Superphosphates	0	1	0
Nitro-supers	0	1	0
Basic Phosphates	0	1	0
Complete Manures	0	1	0
Market Garden Manures	0	1	0
Bone and Supers	0	6	0
Bone Fertilizers	0	5	0
Ground Rock, Phosphates	0	2	9
Phosphoric Acid in Fine Bone	0	6	0
,, ,, Coarse Bone	0	5	0
Roasted and Intensely Ground, Phosphate	0	5	10
Potash	0	8	11

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No 2652) FOR THE YEAR 1923.

Description of Fertilizer.	Brand	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.					
Mainly Nitrogenous.		%	%	%	%	%	%	%	%	%	%	%	£	s	d.	
Nitrate of Soda ..	Federal, S.N ..	15·50	..	..		..	15·50	..	..			..	20	0	0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" " ..	Mt. Lyell, M.L., in diamond	15·50	..	..	..	..	15·50	..			..	..	20	0	0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Wischer and Co. Pty. Ltd.	15·50	..	..			15·50				..		20	0	0	Wischer and Co. Pty Ltd., 153 William-street, Melbourne
" " ..	"Sickle" ..	15·50	..		..	..	15·50	..		..		..	20	0	0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
Sulphate of Ammonia ..	Federal, A.S. ..	..	20·00	..	..	..	20·00					..	18	0	0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" " ..	Mt. Lyell, M.L. in diamond	..	20·00		..	..	20·00					..	18	0	0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Wischer and Co. Pty. Ltd.	..	20·00	..	..	..	20·00					..	18	0	0	Wischer and Co. Pty Ltd., 153 William-street, Melbourne
" " ..	"Sickle" ..		20·00	..	..	..	20·00	..			..	..	18	0	0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	M.G. Co., in diamond	..	20·59	..	..	..	20·59				..	..	17	7	6	The Metropolitan Gas Company, Flinders-street, Melbourne
" " ..	G.G.C., in diamond ..	..	20·90	..	..	..	20·90	..			..	..	18	0	0	The Ballarat Gas Co., Ballarat
Blood Manure ..	Rohs, in circle ..	..		9·50	..	..	9·50	..	..	..	..	..	14	0	0	P. Rohs Pty. Ltd., Bendigo Bone Mills, Bendigo East
" ..	M.C.C., in diamond ..		..	8·00	..	..	8·00	..	..	1·22	1·22	0·52	7	15	0	Melbourne City Council, City Desiccating Works, Smithfield-road, Kensington
" ..	"Arch" ..		..	10·50	..	..	10·50			1·50	1·50	..	12	0	0	Ballarat and District Co-op. Freezing Co. Ltd., Learmonth street, Alfredton, Ballarat

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand.	Nitrogen						Phosphoric Acid.					Price asked per ton.			Where Obtainable.
		As Nitrate.	As Ammonia	As Blood.	As Bone and Flesh	As Unspecified	Total.	As Water Soluble	As Citrate Soluble.	As Citrate Insoluble.	Total.	Potash.				
		%	%	%	%	%	%	%	%	%	%	%	£	s	d.	
Mainly Potassic.																
Sulphate of Potash ..	**Federal** ..	..	..	..	..	..	..	..	..	..	..	50·00	22	5	0	**The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne**
„ „ ..	**"Sickle"**	..	..	..	..	..	..		..	..	..	50·00	22	5	0	**Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne**
„ „ ..	**Mt. Lyell, M.L., in diamond**	..	..		..	..	..	..	..	..	..	50·00	22	5	0	**Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne**
„ „ ..	**Wischer and Co. Pty. Ltd.**	..	..	..	..	..	..		..	..	..	50·00	22	5	0	**Wischer and Co. Pty. Ltd., 153 William-street, Melbourne**
„ „ ..	**Hasell's** ..	..	..	..	..	..	..		..	..	..	48·65	25	0	0	**Arthur Harry Hasell, 17 Queen-street, Melbourne**
Mainly Phosphatic—Readily Soluble.																
Superphosphates ..	**Federal, O.S.** ..	..	..	..			..	17·00	0·50	0·50	18 00	..	5	5	0	**The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne**
„ ..	**"Sickle," Florida Super**	..	..	..	..	..	..	17·00	0·50	0·50	18 00	..	5	5	0	**Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne**
„ ..	**Mount Lyell, M.L., in diamond, No. 1**	..	..	..	..	..	..	17·00	0·50	0·50	18·00		5	5	0	**Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne**
„ ..	**Wischer and Co. Pty. Ltd.**	..	..	..	..	..	..	17·00	0 50	0·50	18·00		5	5	0	**Wischer and Co. Pty. Ltd., 153 William-street, Melbourne**
„ ..	**Cresco 18 Super** ..	..	..	..	..	..	..	17·00	0·50	1 00	18·50	..	5	5	0	**Cresco Fertilizer Ltd., 111 North-terrace, Adelaide, South Australia**
„ ..	**Federal, S.S., Special, 22 per cent.**	..	..	..	..		..	20·50	0 50	1 00	22·00	..	6	7	6	**The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne**

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand,	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.					
Mainly Phosphatic—Readily Soluble—continued.		%	%	%	%	%	%	%	%	%	%	%	£	s.	d.	
Superphosphates ..	"Sickle," 22 per cent.	..	..	..	..	..	..	20·50	0·50	1·00	22·00	..	6	7	6	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Mount Lyell, M.L., in diamond, M.L. Special, 22 per cent.	..	..	.		..	.	20·50	0·50	1·00	22·00	..	6	7	6	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Wischer and Co. Pty. Ltd., Special, 22 per cent.	..	..	..	..	..	.	20·50	0·50	1·00	22·00	..	6	7	6	Wischer and Co. Pty. Ltd., 150 William-street, Melbourne
..	Cresco 22 Super	..	..	..	.	..	..	21·00	0·50	1·00	22·50		6	7	6	Cresco Fertilizers Ltd., 111 North-terrace, Adelaide, South Australia
Moderately Soluble.																
Basic Phosphate ..	"Federal," B.P. .	..	.	..	..	.	.	..	14·00	3·00	17·00	..	5	5	0	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" ..	"Sickle"	.	.	.	..	..		..	14 00	3·00	17·00	..	5	5	0	Cuming, Smith, and Co. Pty Ltd., 65 William-street, Melbourne
" .	Mount Lyell, M L., in diamond	..	.	..	..	..	..	..	14·00	3·00	17·00	..	5	5	0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Wischer and Co. Pty. Ltd.	..	..	..	..	..	..	.	14·00	3·00	17·00	..	5	5	0	Wischer and Co. Pty. Ltd., 150 William-street, Melbourne
Slowly Soluble.																
Ground Phosphate ..	"Hasell's" Marion, 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	5	0	0	Arthur Harry Hasell, 17 Queen-street, Melbourne
" ..	Federal, G.P. ..	..	..	..	..	..	..	..	..	36·65	36·65	..	5	2	6	The Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" .	"Sickle," 80 per cent.	..	..	..	..	..	..	..	.	36·65	36·65	..	5	2	6	Cuming, Smith, and Co. Pty. Ltd. 65 William-street, Melbourne
" ..	"Sickle," 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	4	7	6	" " "
" ..	"Sickle," 50 per cent.	..	..	..	..	..	..	..	..	23·00	23·00	..	4	0	0	" " "

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh	As Unspecified	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.					
***Mainly Phosphatic—Slowly Soluble*—continued.**		%	%	%	%	%	%	%	%	%	%	%	£	s.	d.	
Ground Phosphate ..	Mount Lyell, M.L., in diamond, 80 per cent.	..	..	..	..	..	..	..	..	36·65	36·65	..	5	2	6	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Mount Lyell, M.L., in diamond, 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	4	7	6	" " "
" ..	Mount Lyell, M.L., in diamond, 50 per cent.	..	..	..	..	..	..	..	..	23·00	23·00	..	4	0	0	" " "
" ..	Wischer and Co. Pty. Ltd., 80 per cent.	..	..	..	..	..	..	..	..	36·65	36·65	..	5	2	6	Wischer and Co. Pty. Ltd., 150 William-street, Melbourne
" ..	Wischer and Co. Pty. Ltd., 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	4	7	6	" " "
" ..	Wischer and Co. Pty. Ltd., 50 per cent.	..	..	..	..	..	..	..	..	23·00	23·00	..	4	0	0	" " "
Roasted and Intensely Ground Phosphate	"Victoria," Phosphate	..	..	..	..	..	..	..	3·00	12·00	15·00	..	4	8	6	The Phosphate Co-operative Co. of Australia Ltd., 440 Little Collins-street, Melbourne
Coarsely Ground Phosphate	Victoria Phosphate, No. 3	..	..	..	..	..	..	..	..	14·00	14·00	..	2	16	0	" " "
" "	Victoria Phosphate, No. 4	..	..	..	..	..	..	..	..	11·00	11·00	..	2	5	0	" " "
Mixed Manures. Containing Nitrogen and Phosphoric Acid. Moderately Soluble.																
Market Garden ..	"Sickle" ..	..	1·50	..	0·56	1·00	3·06	9·77	1·00	1·16	11·93	1·87	8	2	6	Cuming, Smith, and Co. Pty. Ltd. 65 William-street, Melbourne
" ..	Mt. Lyell, M.L., in diamond	..	1·50	..	0·56	1·00	3·06	9·77	1·00	1·16	11·93	1·87	8	2	6	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Wischer and Co. Pty. Ltd.	..	1·50	..	0·56	1·00	3·06	9·77	1·00	1·16	11·93	1·87	8	2	6	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
" ..	Federal, M.G. ..	..	1·50	..	0·56	1·00	3·06	9·77	1·00	1·16	11·93	1·87	8	2	6	Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton			Where Obtainable
		As Nitrate.	As Ammonia	As Blood.	As Bone and Flesh	As Unspecified	Total	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.					
Containing Nitrogen, Phosphoric Acid, and Potash. (Fairly Soluble.		%	%	%	%	%	%	%	%	%	%	%	£	s	d	
Complete Manure ..	"Sickle No. 1" ..	..	1·50	.		1·00	2·50	9·92	0·29	0·29	10·50	7·05	9	10	0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Mt. Lyell, M.L., in diamond, No. 1	.	1·50	..		1·00	2·50	9·92	0·29	0·29	10·50	7·05	9	10	0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Wischer and Co. Pty. Ltd., No. 1		1·50			1·00	2·50	9·92	0·29	0·29	10·50	7·05	9	10	0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
" ..	Federal, No 1 .		1·50	.		1·00	2·50	9·92	0·29	0·29	10·50	7·05	9	10	0	Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" ..	Sickle, No. 2 ..		1·00		..	1·00	2·00	10·04	0·29	0·29	10·62	4·46	7	17	6	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Mt. Lyell, M.L., in diamond, No. 2	.	1·00	..	..	1·00	2·00	10·04	0·29	0·29	10·62	4·46	7	17	6	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Wischer and Co. Pty. Ltd., No. 2	.	1·00	..	..	1·00	2·00	10·04	0·29	0·29	10·62	4·46	7	17	6	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
" .	Federal, No. 2 ..		1·00	..	.	1·00	2·00	10·04	0·29	0·29	10·62	4·46	7	17	6	Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" .	Anglo - Continental Guano		4·87	.			4·87	8·85	2·39	1·37	12·61	1·89	23	10	0	Gibbs, Bright, and Co., 34 Queen-street, Melbourne
Containing Phosphoric Acid and Potash. Slowly Soluble.																
Mixed Manure ..	Mixed Victoria Phosphate and Potash Sulphate	.	..	.	..	.	.	..	4·00	9·50	13·50	5·00	8	6	0	The Phosphate Co. of Australia Ltd., 440 Little Collins-street, Melbourne
Containing Nitrogen and Phosphoric Acid—Readily Soluble.																
Nitro-Superphosphate ..	Federal, N.S. ..	..	1·50	..	0·50	.	2·00	13·00	1·01	1·15	15·16	..	7	2	6	Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh	As Unspecified	Total	As Water Soluble.	As Citrate Soluble	As Citrate Insoluble	Total					
		%	%	%	%	%	%	%	%	%	%	%	£	s.	d.	
Containing Nitrogen and Phosphoric Acid—Readily Soluble—continued.																
Nitro-Super ..	"Sickle" ..		1·50		0·50		2·00	13·00	1·01	1·15	15·16	..	7	2	6	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
Nitro-Superphosphate ..	Mount Lyell, M L. in diamond		1·50		0·50		2·00	13·00	1·01	1·15	15·16		7	2	6	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
"	Wischer and Co. Pty. Ltd.		1·50		0·50		2·00	13·00	1·01	1·15	15·16		7	2	6	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Bonedust and Super	Bendigo. Rohs, in circle				1·50		1·50	8·50	5·25	4·25	18·00		8	15	0	P. Rohs Pty. Ltd., Bendigo Bone Mills, Bendigo East
Super and Bone	"Sickle"				0·75		0·75	14·45	1·37	1·58	17·40		6	12	6	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
"	Federal B.S.				0·75		0·75	14·45	1·37	1·58	17·40		6	12	6	Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
"	Mt. Lyell, M.L., in diamond		..		0·75		0·75	14·45	1·37	1·58	17·40	..	6	12	6	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
"	Wischer and Co. Pty. Ltd.				0·75		0·75	14·45	1·37	1·58	17·40		6	12	6	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Blood, Bone, and Super	Bendigo. Rohs in circle				4·00		4·00	5·50	6·25	2·25	14·00		10	10	0	P. Rohs Pty. Ltd., Bendigo Bone Mills, Bendigo East
" "	Federal B.B.S.				2·40		2·40	10·20	1·56	1·84	13·60		7	17	6	Australian Explosives and Chemical Co. Ltd., 370 Little Collins-street, Melbourne
" "	Sickle				2·40		2·40	10·20	1·56	1·84	13·60		7	17	6	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
" "	Mt. Lyell, M.L., in diamond		..		2·40		2·40	10·20	1·56	1·84	13·60		7	17	6	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Bone and Flesh.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
***Containing Nitrogen and Phosphoric Acid—Readily Soluble—*continued.**		%	%	%	%	%	%	%	%	%	%	%	£ *s.* *d.*	
Blood, Bone, and Super	Wischer and Co. Pty. Ltd.	.	..		2·40	..	2·40	10·20	1·56	1 84	13 60	.	7 17 6	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Bone and Super ..	Gardiner's	..	.	..	1·39	..	1·39	3·20	5·80	8·00	17·00	..	7 15 0	George Gardiner and Co. Pty. Ltd., Marshall, Geelong
Moderately Soluble.														
Blood and Bone ..	Arch	..	..	5·00	..	.	5·00	..	3·50	9·00	12·50	..	9 0 0	Ballarat and District Co-op. Freezing Co. Ltd., Learmonth-street, Alfredton, Ballarat
Bonedust and Blood ..	Bendigo, Rohs, in circle	..	..	6·00	..	..	6·00	..	3·00	6·00	9 00	..	12 10 0	P Rohs Pty. Ltd., Bendigo Bone Mills, Bendigo East
Bone Fertilizer ..	Samson's	..	.	..	2·00	..	2·00	..	2·00	15·00	17·00	..	7 12 6	George Gardiner and Co. Pty. Ltd., Marshall, Geelong
" ..	Gardiner's Special Magic Fertilizer	..	.	5·00	..	.	5·00	..	3 00	10·00	13·00	.	8 5 0	" " "
" ..	No. 2 Magic .	..	..	..	1·50	..	1·50	..	1·50	14 50	16·00		7 5 0	" " "
" ..	No. 1 Magic ..	..	..	..	2·00	..	2·00	..	2·00	15·00	17 00	.	7 12 0	" " "
" ..	Bailey Bros. ..	..	..	..	2·50	..	2·50	..	6·50	9·50	16·00	.	8 0 0	Bailey Bros., 155 Main-street, Ballarat East
Animal Fertilizer ..	A.N.A., Surprise .	..	..	..	3·00	..	3·00	..	4·00	12·00	16·00	.	9 10 0	George W. Pennell, Braybrook
Bone Fertilizer ..	Ark	..	..	..	3·16	..	3·16	..	3·66	15·60	19·26	..	7 10 0	Arthur Murphy, Barkly-street, Ararat

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand.	Nitrogen as Bone.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust	Horse Shoe ..	4·00	18·00	40·00	60·00	9 10 0	P. Fitzgerald and Sons, Warragul-road, Bentleigh
"	Bailey Bros., Mount Clear	3·00	18·00	30·00	70·00	8 10 0	Bailey Bros., 155 Main-street, Ballarat
"	Bendigo, Rohs, in circle	4·00	18·00	55·00	45·00	10 10 0	P. Rohs Pty. Ltd., Bridge-street, Bendigo
" . ..	White Horse ..	2·50	17·00	60·00	40·00	7 15 0	Frederick Walter Richards, Warrenheip
"	Tooram, G. Bros. ..	3·62	21·74	71·50	28·50	8 10 0	Chas. Wm. Gladman, Allansford

P. RANKIN SCOTT,
Chemist for Agriculture.

Melbourne, 28th November, 1922.

THE LARGE WHITE PIGS.

Genesis of the Breed.

In an English exchange, Professor James Long has told the story of the Large White pig. It is, he says, difficult to believe that prior to 1851 British pigs were practically mongrels, and that since that date they have not only changed the whole aspect of the industry, but they have improved the pigs of every important agricultural country in the world. Mr. Long states that he is aware of no single breed outside the British Islands—the United States excepted—which is worthy to be classed in the same category as our own pure-bred varieties. The Berkshire was regarded as a pure breed in the first half of last century, but it was little better than a mongrel, and not until the appearance of the Large White York at the Royal Show in 1851 had there been any symptom of that extraordinary improvement in the pig which has since taken place.

In the northern counties pigs had been kept in herds and at liberty for ages. They were of large size; they possessed long bodies and long heads, large ears, flat sides, plenty of coarse hair, and legs which enabled them to walk long distances to market. The breeder of the Large York—Tuley, a Keighley weaver, made use of types of pig which enabled him to evolve the new variety—grafting upon size those symmetrical and feeding properties which have since made it famous. No breed has achieved such fame, and none has so far distanced all competitors in size and quality.

The Large York, continues the Professor, has a straight back, a wide loin, well-sprung ribs, large well-formed hams, meat down to the hocks, straight legs, a deep thick belly, adapting it to the production of abundance of streaky meat for pickled pork or rashers for the breakfast table; and a neck of medium length, without that thickness of collar which provides so large a quantity of cheap meat at the fore-end of the flitch. The head is long and not dished, as in the Middle breed, while the ears—no longer the large white flappers of the past—are medium, well-formed and straight, standing well forward over the face.

The chief qualifications of the Large White are constitution, rapid growth, fine quality of meat, without too much fat, and great size, which tells at an early age.

The Large White has been used in the improvement of other breeds, as well as in the conversion of the common pigs of the country into swine of a useful character; and it is largely owing to its influence that bacon of to-day is young, tender, and such a favorite food. In earlier days pigs were not killed, as a rule, until they were eighteen months old, but it is now the common practice to slaughter porkers under twenty weeks and baconers a month or two later. This practice not only secures superior meat, but it is produced so much cheaper—it no longer paying to feed for larger size.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

If the work has not already been done, the orchard should be kept in constant cultivation so as to conserve the abundant spring rains. Should the summer become hot and dry, this will be a very necessary precaution. Even where the soil had been previously well cultivated, the cultivators should again be run over the surface, as any hot weather will cause the soil to crust, which would be the means of dissipating a very considerable amount of soil water. Every effort should be taken to retain this moisture so that the fruit crops shall have all they require for their perfection. To further attain this end no weeds should be allowed to grow in orchard soils

BUDDING.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and that atmospheric conditions may not have too drying an effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be flowing freely, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres, and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It should be cut from the scion with a shallow cut, and if any wood be left in the cutting it should be taken out of the bud. A smooth, clean spot should be selected on the bark of the stock, and a T-shaped cut made, the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pressed down into position, and then bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level by means of a horizontal cut. With practice it will soon become possible to take the buds so that they will need neither cutting nor trimming.

After two or three weeks the buds should be examined to see if they have "taken"—that is, if the bud has united thoroughly to the stock. When this occurs, the tie may be cut. If a growth be desired at once all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequent loss of the bud, and so as to throw the bud out at a fair angle. Ultimately this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till spring. In this case the branch should not be cut off, but left on till the usual winter pruning.

SUMMER PRUNING.

The profuse spring rains have caused a vigorous growth in the fruit trees. In order to more economically utilize this abundant growth, it should be now summer pruned, particularly on the apple and pear trees. Care should be observed that as much of the leafage as possible is retained on the tree. Unduly long laterals of fruiting trees may be shortened back, always cutting to a leaf. Unnecessary terminal leader growths, of which there are sometimes three or four, all strong growing, may be reduced to one, retaining this one as a leader. In no case should this growth be cut or interfered with in any way.

The results of these cuts will be to divert the sap which was flowing into growths that would subsequently be pruned, into more profitable channels, so that weak buds and growths may be strengthened, and induced into fruit bearing.

The Vegetable Garden.

The work in this section is much the same as in the flower garden. Good mulching and regular soil stirring will be the work for the month. As soon as any bed is cleared of vegetables it should be manured and well dug over in preparation for the next crop. Deep digging is always desirable in vegetable growing. If any pest, such as aphis, or caterpillars, or tomato weevil, have been present, it would be advisable to burn all the crop refuse, or to destroy any insects that remain, and to give the plot a dressing of gypsum, or of Clift's manurial insecticide.

Keep the tomatoes well watered and manured, pinching out surplus and strong grown laterals. In early districts the onion crop will be ripening. In late districts, or with late crops, the ripening may be hastened by breaking down the top. An autumn crop of potatoes may be planted. Cabbage, cauliflower, lettuce, and celery plants may be planted out. Keep asparagus beds well watered.

The Flower Garden.

January should be a busy month in the garden. It may be necessary to water frequently, and after every watering the surface should be well loosened, and stirred with the hoe to keep it moist and cool. More cultivation and less water is a good rule to be observed. The hoe should be used more, and the hose less, in summer; greater benefits will accrue, and the water bill will be considerably reduced. Mulchings with straw, grass, &c., are very useful just now. The mowings from lawns form valuable mulching. Waste tobacco stems are also valuable as a mulch.

Dahlias, chrysanthemums, gladioli and other tall-growing, slender herbaceous plants will require support in the way of stakes. They will also need mulching considerably. These plants should receive no check whatever, and should be continued with a regular even growth right through the season. Another desideratum is that soils should be well drained, as plants of all descriptions thrive better in well-drained soils.

A sharp look-out should be kept on these plants for attacks of red spider. If this insect appears, a good spraying of tobacco solution or benzole emulsion should be given.

Constant watch will need to be kept for the various small caterpillars that attack the buds of these plants. Spraying with a weak solution of paris green and lime, or similar insecticide, will be useful. Hand-picking should also be resorted to.

REMINDERS FOR FEBRUARY.

LIVE STOCK.

HORSES: *At grass.*—Supplement dry grass, if possible, with some greenstuff. Provide plenty of pure water and shade shelter. *In stable.*—Supplement hard feed with some greenstuff, carrots, or the like, and give a bran mash once a week at least. Avoid over-stimulating foods, such as maize and barley. Give hard feed in quantities only consistent with work to be performed. Stable should be well ventilated. and kept clean. When at work, give water at short intervals. Always water before feeding. Great benefit will result in supplying horses—more especially young ones running at grass—with a lick. The following one is recommended:—

Salt	20 parts
Lime	20 parts
Superphosphate	10 parts
Sulphate of iron	5 parts.

By having troughs constructed that will protect the lick from rain a considerable saving will be made.

Horses at grass require their feet attended to at frequent intervals, otherwise deformity of feet and lameness may result.

CATTLE.—Provide succulent feed and plenty of clean water easy of access; also shade and salt lick in trough. Have each cow's milk weighed and tested for butter fat regularly. Rear heifer calves from those that show profitable results. Give milk at blood heat to calves. Keep utensils clean or diarrhœa will result. Do not give too much at a meal for the same reason. Give half-a-cup of limewater per calf per day in the milk. Let them have a good grass run or lucerne, or half-a-pound of crushed oats in a trough. Dehorn all dairy calves except those required for stud or show purposes. Keep bulls away from cows.

PIGS.—Sows about to farrow should be supplied with short bedding in well-ventilated styes. All pigs should be provided with shade and water to wallow in There will be plenty of cheap feed available now, and there is a good margin between cost of feed and price for fat pigs. Read *Bulletin* No. 16.

SHEEP.—In the case of very strong cross ewes, rams should not be removed until well on in this month, for this class, together with most pure ewes of British blood, are only now coming in season. To breed out this late lambing tendency, and to procure quality and quantity of wool as well as a good carcass, use carefully-bred, level-made merino rams. If the right type be not procurable at reasonable rates, use good Corriedales or Comebacks. Should there be among the rams any inferior to the others, keep them back for three weeks. Remember, narrow inferior rams are invariably the most active workers compared with sheep of more substance.

POULTRY.—Chickens should now be trained to perch: they will be more healthy.

Provide plenty of green feed and give less grain and meat. Avoid condiments. Keep water in cool shady spot and renew three times each day. Keep dust bath damp.

Birds showing symptoms of leg weakness should be given 1 grain of quinine per day (three months old chickens, ½ grain) and plenty of milk.

CULTIVATION.

FARM.—See that haystacks are weatherproof. Cultivate stubble and fallow, and prepare land for winter fodder crops. Get tobacco sheds ready for crop. In districts where February rains are good, sow rye, barley, vetches, and oats for early winter feed.

ORCHARD.—Spray for codlin moth. Search out and destroy all larvæ. Cultivate the surface where necessary and irrigate where necessary, paying particular attention to young trees. Fumigate evergreen trees for scale. Continue budding.

FLOWER GARDEN.—Cultivate the surface and water thoroughly during hot weather. Summer-prune roses by thinning out the weak wood and cutting back lightly the strong shoots. Thin out and disbud dahlias and chrysanthemums Layer carnations. Plant a few bulbs for early blooms Sow seeds of perennial and hardy annual plants.

VEGETABLE GARDEN.—Continue to plant out seedlings from the seed-beds. Sow seeds of cabbage, lettuce, cauliflower, peas, turnips, and French beans. Keep all vacant plots well dug.

VINEYARD.—February is the best month for the "yema," or summer bud graft (see *Bulletin* No. 35, available on application). Select and mark the best-bearing vines of varieties from which scions will be required for next spring's grafting.

Given suitable climatic conditions, downy mildew will make its appearance. If vines were not sprayed in January they should be sprayed this month. The final spray (January or February) is most important for the protection of the foliage, thus insuring the ripening of the fruit and well-nourished wood, without which a good crop cannot be expected next year. Sulphur again, if oidium is prevalent, but avoid sulphuring wine grapes too short a time before gathering. The sulphur may be mixed with Bordeaux mixture, thus enabling the two diseases, oidium and downy mildew, to be combated simultaneously.

Cellars.—Prepare all plant and casks for the coming vintage. An ounce of bisulphite of potash, or a couple of fluid ounces of bisulphite of soda solution, to each bucket of water used to swell press platforms, tubs, &c., will help to keep it sweet. Keep cellars as cool as possible. Complete all manipulations so as to avoid handling older wines during vintage.

In the case of very hot weather occurring during vintage, attention is directed to the new wine-making method by "Preliminary Maceration," described in a pamphlet obtainable on application.

UNITED STATES BACON EXPORT.

It is reported that a movement has been started in the United States which has for its object the improvement of the quality of bacon intended for the British market. Up to the present, American exporters have supplied the British market with a heavy volume of cheaper bacon than that offered by other exporting countries, but no special attention appears to have been given to quality. It is understood that what is proposed is a thorough study by the United States Department of Agriculture, or other competent authority, of the problem so far as improved production is concerned, combined with co-operation between the packers' and producers' organizations in finding out British requirements and bringing their products up to this standard.—*Agriculture at Home and Abroad* (Eng.)., September, 1922.

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DAIRY FARMING IN VICTORIA.

By J. S. McFadzean, Senior Dairy Supervisor

SOME FACTS ABOUT THE INDUSTRY.

The time is fast approaching when the dairying industry will be definitely accorded its inevitable place as the most important branch of Victorian agriculture. Wool and wheat are mainly products of large land areas. Closer settlement and irrigation extensions are gradually subdividing the large areas of good land, and advanced knowledge in regard to dairy farm work is steadily increasing the acre production of land used in this line of farming. When properly carried on, dairy farming gives a much greater return in cash per acre than either wool or wheat; consequently, under increased settlement, dairying is ever superseding these other branches of agriculture.

So far as natural advantages are concerned, it is generally conceded that if there is any best country in the world for those engaging in the dairying business, most certainly it is the State of Victoria. Good climate, good water supply, and good soil are the essential local conditions which make for success in this industry, and all of these are co-existent over a large portion of the State. Certainly, the clearing of heavy timber, or the improvement of the existing water supply by irrigation channels or well sinking, has been necessary to complete the requirements on some blocks after subdivision has taken place; but in such cases, not only has the climate and quality of the soil warranted the work, but the results obtained have demonstrated the soundness of the proposition. Indeed, so well adapted are some Victorian districts for dairying farming that this business is carried on by many farmers by milking their cattle on pasture alone, and without any fodder growing or hand-feeding of any kind.

If care is taken not to overstock the land and to have sufficient paddocks on the farm to hold some surplus grass in reserve against a season unfavourable to growth, there are many places where dairying may be profitably carried on under this method. However, there is no question that even in the most favoured localities it is possible to greatly increase the production of the dairy herds by systematic hand-feeding; for, with a regular and abundant supply of silage or other succulent fodder at hand, the cows may be held to their full possible productiveness, despite any unfavorable seasonable changes. Under the average existent local conditions dairying can be and should be made more highly profitable here than in any other country.

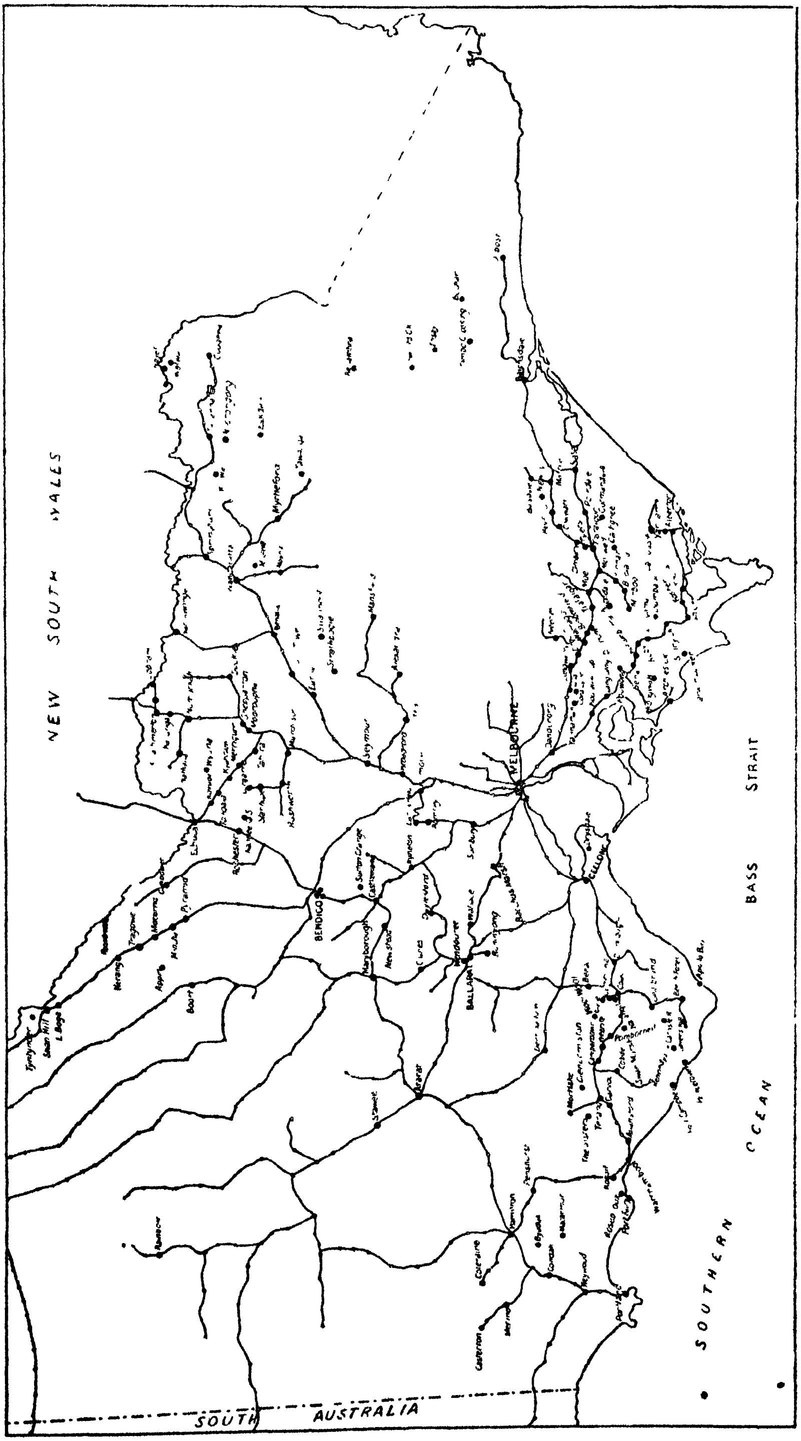
In regard to the handling of dairy produce direct from the farms, a glance at the Victorian railway map on page 67, whereon the factories and creameries now working are marked, it will be recognised that conveniences for carriage and treatment of dairy farm products are both numerous and very widely distributed. Possibly nothing is so good that it cannot be improved on, and further development both as to railways and factories is continually taking place, but even now there are comparatively few parts of the State where the farmer has to travel any great distance to dispose of his dairy produce. Further, to those unacquainted with the natural resources of the State, this map is a striking illustration of the extent to which dairying has become an established industry. Each of those factories and creameries is owned by either proprietary or co-operative companies, and represents a centre where it was evidently a payable proposition to establish such a depôt.

At present the annual value of the dairying industry in Victoria is represented by over seven million pounds sterling, equivalent to a return of between £11 and £12 per cow each year, and it is made up as follows:—

Milk consumed, fresh (at 1s. per gallon), 1 quart per family per day	£1.268,000
Milk, condensed, at 8d. per lb.	1,260.000
Butter made	3,220.000
Cheese made	176,000
Dairy cows, dried off and fattened for beef (at £9 per head)	720.000
Calves, for veal (at £1 per head)	340.000
Skim milk for pig feed ..	33,000

With 600,000 dairy cows in the herds of the State, the above average per cow may be taken as approximate, a large part of this return having been prepared from figures obtained under more or less careless and haphazard methods. All the same, it illustrates the wonderfully potential natural advantages the State possesses. Under anything like systematic management on even a bare majority of the farms, this average would be greatly increased. Good dairy farmers with fairly large herds will get an average production of over 600 gallons of milk per cow; whereas the average per cow yield of the State does not reach two-thirds of that quantity, indicating that there is room for an average increase in production of over £6 per cow per year. To a farmer with even fifteen cows this means that, by keeping only good dairying cattle and through good feeding, making them produce milk to somewhere approaching their maximum, another £2 per week could be added to his annual income, merely by the study and practice of systematic dairy farm methods.

If dairy farming is worth following as a business it might as well be made fully remunerative by those engaging in it. There is little



Map Showing Position of Victorian Butter Factories.

sense in so mismanaging any business that it becomes less profitable than it should be. The keeping of cattle which are at best only fit for fattening, and which hold to their milk for only a few months of each year, is the cause of great annual loss to dairy farmers. On large areas, under cheaper land values and cheaper labour conditions, this inferior class of milking cattle was formerly more profitable than now; and because the earlier settlers could pay their way with this class of stock their families see no reason to make special effort to vary their custom by breeding and culling to improve the milking quality of those cattle required for present-day dairying work.

In the earliest settlement cattle raising was one of the first branches of agriculture taken up; and the class of cattle best suited for raising beef, tallow, and hides, under rough country conditions, was far removed in quality from what is now required for advanced dairy farming. The dairying on the early cattle stations was rough work. The cows and calves were herded together through the day, but were rounded up in the evenings, and the calves drafted off from them. In the morning as much milk was taken from the cows as they would let down under the excitement of being roped into the bail with their calves bellowing near by. The calves were then turned out again with the cows until evening.

Under this method the cows seldom milked longer than over the few spring months; but they raised strong calves, and held enough condition on themselves to winter well and produce another strong calf each season. Those which milked longest and got low in condition in the summer months had little chance of surviving any unusual scarcity of grass, and it was the worst milkers that usually stood up best to any stress of season. This survival of the fittest, therefore, encouraged the increase of anything but good dairy stock. As the land became more settled, and dairying as a business began to break in upon the beef-raising, it was largely from the progeny of these old station cattle that the future dairy stock were bred. Selection of the cows on appearance, and mating with so-called dairy-bred bulls of more or less doubtful dairy quality has, in too many cases, been the foundation on which Victorian dairy herds were laid.

Where the milking performances of the breeding cows, both as regards quantity and quality, has been made the basis of selection, and development of dairy quality in the offspring has been also striven for by judicious selection of pure-bred sires on the dairy merit of their dams, both definite and rapid improvement in the productiveness of the stock has invariably been made. Special importations of certified high-class dairy cattle have for many years past been made by breeders of exhibition stock; but it is only recently that the dairy value of these choice imported cattle has been recognised.

The system of regularly testing pure-bred cattle as to their individual dairy excellence was inaugurated by the Victorian State Department of Agriculture in July, 1912, and the information thus obtained as to the actual dairy quality of pure-breed stud stock is now made available periodically. Dairymen have thus a definite guide to the utility quality of animals of whatever dairy breed they decide to use in the improvement of their herds.

The elimination of the old-time beef strains of cattle and their replacement with true dairy stock is, however, in many instances proceeding but slowly. Hundreds of farmers never read any dairy literature. Besides this, many who do read of big dairy records being made are sceptical of their being reliable. Their own experience does not prepare them to believe that other people's dairy cows can give three or four times more milk than those they own; and in disbelieving such records they close out all incentive to emulate them.

Thousands of farmers never weigh or test the milk of any of their cows, and know nothing definite about the yearly production in milk or butter-fat of their dairy stock. If it were not for the fact that there is generally a little cash coming in each year from the pigs and calves sold, many of these more careless dairymen would never be able to pay their way, owing solely to the number of unprofitable butter-producing cows they are keeping at the expense of whatever profit is made by their few good milkers.

Nevertheless, each year finds a few more farmers deciding to breed better stock, and it is not long before such change excites the inquiring notice of one or two of the neighbours, and they, too, are on the way towards the necessary improvement. Good cows make the dairying business highly profitable, and as the prosperous family seldom falls out with their special line of business, it may safely be said that in really profitable dairy cows lies one of the most effective means of making country life attractive. Stock-breeding is a science which aims at improving cattle by the systematic selection, mating, and general care of animals of the highest quality in some definite line of production. Amongst the thousands of farmers who raise cattle, very few indeed are justly entitled to be termed "breeders." Quite a large number of them are only spoilers of the work of others through indiscriminate selection, the deliberate crossing of established breeds, or the using of cross-bred bulls.

Definite improvement in stock-breeding can only be attained by the use of pure-bred sires which have been selected with the utmost care as to both excellence in the desired qualities, and soundness of constitution. Especially with dairy cattle is a correct knowledge of the breeding of the intended sire of high value. The ability of heifers to produce heavy yields of milk and butter will depend largely on the dairy quality of the dam and grandam of the sire, these qualities being hereditary to a surprising degree through the male side of the parentage. Soundness of constitution and inherent dairy quality have thus all equal bearing in the selection of stud stock, and must each be given full consideration; yet in this both are inseparable from that abstract quality which is spoken of as type.

Type.

When old-time farmers first set out to breed special dairy cattle they soon observed that the majority of animals which were heavy milk producers were not of the same body-shape as those which grew the best beef, the dairy-shaped animals being somewhat spare of flesh, and heavy in girth towards the hinder part of the body, while the beef stock put on flesh freely, and were deeper by far in the forequarter than below the loin. Breeding on these lines, two distinct forms of cattle were evolved, each making for perfection on its own line, and each possessing a neatness of shape and beauty of outline consistent with the desired utility qualities, which have become known as dairy type or beef type respectively.

Sound Constitution Essential.

So far as can be judged from old-time pictures and sculpture, the original breeds of cattle had little in common with the present domestic stock. The accepted standards of beauty were different, but the animals were certainly wiry and robust. Under natural conditions, strength and soundness of constitution were not only essential to an animal's existence, but all matings were controlled by the ability of the strong, active males to drive off intruders from each herd. Natural breeding methods thus perpetuated strength, and especially along those lines of self-preservation, which combine the ability to both travel well and fight vigorously; and that soundness of constitution and physical fitness so essential for the preservation of cattle in their wild state is equally necessary, not only for the improvement, but for the maintenance of all herds of live stock.

Breeding Laws.

Breeding is presumed to be governed by certain so-called laws, but these at best can be but vaguely described, and how far these laws may be influenced by chance conditions is altogether uncertain. Nevertheless, enough knowledge has been gained concerning this subject to enable breeders to carry out their work with a reasonable prospect of success; and it is consequent on this that probable results from given lines of work are referred to as "laws." The principal of these laws are:—(1) That quality reproduces itself, and can also be developed; (2) That atavism, or reversion towards original characteristics, has always to be guarded against; (3) that unaccountable variations may be expected to occur at all times between the progeny of any mating over a succession of years.

Quality Reproduced.

In the practice of stock-breeding it has long been recognised that high quality will be reproduced with much greater certainty in the progeny of animals which have a definite blood relationship than if the parents are of breeding in any way distinct from each other. Continuous breeding from stock possessing some desired quality in a marked degree will accentuate that quality in the progeny, until it eventually will be reproduced with greater certainty in each succeeding generation. In fact, a quality which is present in both parents almost invariably reproduces itself in proportion to the blood relationship which exists between the parents; and it is this law which warrants the value of a pedigree in all stock-breeding.

Pedigree.

A pedigree is a concise record of an animal's lineal descent from ancestral stock, and those who are acquainted with the breeding of an animal through its pedigree are thus enabled to continue the work which former breeders of that line of stock followed. Again, where it is hoped to improve some particular feature in one strain by mating with animals from another, a study of both pedigrees may assist greatly by showing where a blood line exists which is common to both strains. By such knowledge success may be insured more readily, for without it there is every possibility of atavism presenting itself.

Atavism.

Improved strains of cattle are the result of generations of work carried out along lines far removed from the original conditions. The modern dairy cow with her great capacity for turning a bulk of food into large quantities of milk could not exist in a wild state. Instances have been noted where domestic cattle having had the opportunity to become wild have bred, and under those conditions the cows only produce enough milk daily to feed the calves, and that only for a few months until they can subsist on grazing, at which time the cows go dry and begin to fatten. The result is that within a very few generations a marked reversion takes place towards the original rugged type of animal such as is best fitted to live and protect itself and its progeny under such rough conditions as are forced on them in their wild state. Unfavorable seasons and the resulting scarcity of fodder would be naturally provided against by animals laying on fat when food was plentiful, so as to enable them to tide over periods of scarcity. The ability of the modern dairy cow to turn a big bulk of food into a heavy yield of milk necessitates a continuity of food supply; otherwise she would milk on until she became too low in condition to withstand inclement weather, and consequently would die. Nature has therefore allowed that as soon as stock are away from domestic control they quickly recover those original characteristics which would permit of their surviving under the wild state. Pure breeding of stock for generations may have, to all appearance, eliminated all trace of wild character, but the slightest digression from a line of pure breeding encourages its coming again to the surface, and crossing breeds or even strains frequently affords that opportunity. Pure breeding of stock along definite blood lines is continuously making for improvement, but cross-breeding allows of a predominance of wild characteristics in a very few generations; and that tendency to revert to a former type is spoken of as atavism. Pure breeding of stock on definite blood lines thus makes for perfection in improvement, while cross-breeding is the direct route to deterioration in utility qualities.

Proper Feeding Maintains Type.

This atavistic tendency, however, seldom obtrudes without a mixing of blood lines occurs, and in such cases no one can forecast the result further than that it is almost certain to completely disorganize all progress which was being made by those who bred up that stock prior to the crossing. The exception to this is that by forcing stock to live under semi-wild conditions they may be altered very considerably both in appearance and producing capacity. The development of dairy stock has been concurrent with improved feeding methods, and these latter have played no small part in perfecting the modern dairy cow. The well-bred animal, which has become stunted in growth through want of proper nourishment, will never make into as good a producer as similarly-bred stock which are properly fed. Breeding from animals kept under such semi-wild conditions as having to range far and wide to find sustenance encourages the tendency of reversion to the wild character and reduced milk production. Good breeding must be supported by good feeding in order to attain perfection.

Close Selection the Key to Success.

Suppression of atavistic tendency is most quickly attained by line-breeding, which is the systematic mating of only those animals which are of similar blood lines, for by this means progress may be ensured. In this, however, selection of well-grown robust stock for all matings is of the highest importance, as any combination of defects in constitution would result in these being intensified in the offspring. In the wild state robustness of constitution was essential to enable cattle to survive stress of seasons or attacks of predatory carnivora, and any weaklings had little chance of living long enough to breed. By this natural law of the survival of the fittest was perpetuated robustness in wild cattle, and in order to obtain best results breeders must exercise a most rigorous selection in regard to soundness of constitution in connexion with all stock matings. Where this is strictly followed line-breeding will make for success.

Crossing Makes for Deterioration.

All progress in pure stock-breeding has been made on line-breeding. When either pure breeds or strains of breeds are crossed, the result is a combination in the offspring of any inferior blood that may be behind each parent, and the predominance therein of undesirable characteristics. No line of cross-bred cattle will compare in production with similarly raised pure-bred animals; and it is this which puts the value on breed purity. All crossing of pure breeds makes for a reduction of some special characteristic which has been consistently developed by line-breeding; and the more cattle are crossbred the more inferior the quality of the stock becomes. All the world over the pure-bred dairy breeds are the most productive. Cross-breeding is a wasteful retrograde practice, the only excuse for which is ignorance.

Strain.

When a breeder has worked consistently for the improvement of one or more desirable characteristics in any stock, and has succeeded to such an extent that animals of his breeding become noted for such quality, he may safely claim to have established a "strain" of the breed worked with, consequent on the improvements having become hereditary in the animals bred by him. Any variation inherited from the parents through at least two generations is spoken of as being hereditary, whether it is of type, colour, production, temperament, constitution, or development; and in every strain some such feature will become so inherent as to be noticeable in the majority of the stock bred from it.

Variation Utilized.

Even under the most carefully carried out system of line-breeding there will at times be disappointments consequent on some stock not coming up to expectations; but, on the other hand, occasional super-excellence results, and from such happenings all great advancements in breeding have been made. The history of most breeds of stock contains records of some remarkable animals which have appeared amongst comparatively moderate stock, the special quality of which has been recognised and used to the general advancement of the breed. For instance, the size and shape of udders, as well as thickness and length of teats in dairy stock, has been greatly improved by selection in this way. Horns also which were so essential to the cow in its wild state, and are so awkward in the domestic animal, have in some breeds almost disappeared, while the others have been so reduced in size and substance that they are now of little inconvenience to those handling the cattle. In fact, almost all the good features of the high-class dairy cow have been developed by means of selection during the past two centuries; and on these same lines it is possible for every dairy farmer to make his cattle more and more profitable each year.

Breed to One Strain.

The several breeds and the strains within the breeds of domestic cattle have thus been formed by the mating together of animals similar in size, shape, colour, and other desirable features, and by the continued interbreeding of such stock when properly selected on robustness of constitution. Any tendency to revert to former characteristics then becomes subservient to the qualities more recently inherited. As mentioned, crossing with other breeds or strains has the tendency to re-introduce some of the original features, and retrogression is likely to follow; but the longer a breed is kept pure and free from any outcross, the stronger it will grow and the more resistant it will become to any atavistic influence. While, therefore, an experienced breeder may introduce stock of other strains of which he knows the pedigree into his own strain with a definite object in view, it is advisable that the beginner should carry on his breeding operations with animals of one strain only, or at least mate his cattle under the advice of some breeder who is well acquainted with the foundation stock of the strain the beginner is using.

Choosing a Breed.

The selection of the foundation stock is always a serious problem for an inexperienced person, for there are quite a number of items to be considered therewith. If there is any special fancy for some particular dairy breed, so much the better, every person being more likely to succeed with the breed that "catches the eye" rather than one in which interest has to be more or less acquired. In making a choice there are several breeds to pick from, and the several characteristics of these will be more fully set out at a later date. The Shorthorns, Red Polls, Friesians, and Guernseys are all somewhat large cattle, requiring richer and more level country and heavier feeding than the lighter stock of the Ayrshire and Jersey breeds. On lighter grazing and in hilly country the smaller breeds will prove much the better stock to work with; many dairy farmers also prefer this class of stock to any other, even on rich country, as they are bred specially for dairying without any consideration of what is known as dual-purpose quality. Others again prefer the extra rich milk of either the Jersey or Guernsey cattle for all dairying purposes. Yet in all of these breeds there are various grades of milking stock; and there may also be much variation in the quality of the milk given by the different strains of any breed. The herd-test records of all stock should therefore be carefully examined when choosing foundation stock for a herd.

Where to Buy.

It will be advisable where possible for the beginner to buy the required stock privately even if a few pounds more may have to be paid per head, the probability being that there will be a better choice of good cattle to be obtained privately than in any markets, and there will be better opportunity to make a careful inspection of the animals. The markets are not usually satisfactory places for the inexperienced to purchase at, owing to the number of culls of various sorts which are sent there; but such sales should furnish the novice with some idea of cattle values in a general way. Wherever the purchases are to be made, it will pay to secure the services of a stockman of good repute to assist in making the selection. Where possible, young cows should be chosen in order that the buyer may get good returns from them for the first few years while he is establishing himself in the business, and that a lengthy breeding term may also be possible with them.

Build on a Good Foundation.

If the capital available will permit it, pure-bred stock will be the best to begin with. Otherwise, the next best will be good grade stock, or those as similar in appearance to the desired pure-breds as possible, for these mated to pure-bred bulls of the desired breed will throw stock having much of the quality of the pure-bred cattle. Certainly, the better the breeding of the stock obtained at the outset the more quickly will the dairy herd be established on a profitable basis, and it must be remembered that inferior dairy cattle are dear at any price as the foundation of a herd. Selection should therefore be made with the utmost care in order that only stock of satisfactory dairy quality will be obtained. In the absence of reliable information concerning the milk and butter-fat yields of any cow, the selection must be made on appearance, and it is here that the advice of an experienced stockman will be found most needful.

Production Follows Good Type.

Cows which conform in outline and general appearance to what is known as dairy type are usually good milkers so far as bulk flow is concerned; and the selection of ordinary dairy farm stock is made almost solely on this typical dairy appearance. When making the selection of animals which have had a calf, each quarter of the udder should be felt over carefully to ascertain if its tissue is soft throughout and free from nodules or larger lumps, and if the teat passages are clear of any pea-like obstruction; by such examination before purchasing, the question of soundness or otherwise of the animal in that direction may be settled.

Usually all very good dairy cows may be recognised through their general appearance conforming closely with the typical points, but it is the various grades of cows other than the best milkers which require long experience to value correctly. Some people are very expert at estimating these values, such knowledge being usually the result of keen observation combined with long experience; but the majority of the cattle which are to be found on most dairy farms will show that either such expert buyers are very rare, or that most farmers are extremely unconcerned in regard to the quality of their dairy stock. In either case, the result is the same; and, consequently, through working with inferior stock, many farmers do not get anything like full returns for the work they put in with these inferior-shaped cows.

Points in Selecting.

It is always advisable not to purchase any animal which does not appear to be in perfect health or which is in low condition. Even if bad feeding is the only cause of an unthrifty appearance, it usually takes an animal some time to recover and gain the condition which will allow it to milk to its full capacity. Such loss of time, and the extra feed required, are sometimes not paid for by one season's milking. In the case of springing heifers and cows backward in calf, it is advisable where possible to have a written guarantee with them as to the period within which they will calve.

While it is always best to buy young cows when obtainable, it frequently happens that an aged cow will prove a profitable investment both for milk production and breeding, so long as ample green fodder is supplied. Cows of good constitution have given profitable returns in milk and butter-fat for even twenty years, although half of that time may be set down as the average limit of a cow's usefulness. Where hand-feeding is regularly practised, a good milking cow should be kept in work until she can be replaced with a better young one. The weight of each cow's milk, and her butter-fat yield, should be the standard on which culling out should be done; and 500 gallons of milk, or 250 lbs. of butter-fat for the season, is the minimum yield on which any matured cow should be kept in the herd.

The Guide to Age in Cattle.

The age of cattle in the first few years can be told by examination of the front teeth. A calf has eight somewhat small teeth in the front of the lower jaw at birth. When from fifteen to eighteen months old, the middle two of these are replaced by two larger permanent teeth; at about two years and three months, the next tooth to these on each side will fall out and be replaced; the third pair will be replaced at about three years old; and when at about four years old, there will be eight permanent front teeth, the animal will be spoken of as being full-mouthed. With advancing age, and, to a considerable extent, according to the nature of the pasture, these front teeth will wear down, become loose, and spaces show between them. This makes it more difficult each year for the animal to keep up condition, even on good grazing, and necessitates more hand-feeding. These teeth may wear right down to the gum without falling out, but should any fall out or several become loose, the whole of them will be best drawn, and the animal kept altogether on hand-feeding until the gums harden sufficiently for her to graze again on good pasture. With good cows, this will occasionally be worth following; but otherwise, as soon as the animal's ability to graze properly becomes impaired, she should be fattened and sold for slaughter.

Choosing a Bull.

The choice of the bull to mate with the breeding cows of the herd is the most important item to be considered. On this will certainly depend the future progress or otherwise of the herd; and so far as dairy pedigree is concerned, no one should be satisfied with anything below the very best obtainable. As the Victorian Department of Agriculture has been conducting annual tests of pure-bred dairy stock for ten years past, there is now a wide field for selection amongst bulls bred from heavy-yielding dairy cows. All these cows and heifers so tested have stud-breeding pedigrees which are approved by the various societies controlling the registration of pure-bred dairy stock. In addition to this, all which give yields above the fixed minimum standards of profitable production are awarded a certificate. A list of certificated cows for the season, with their yields, is printed in the *Journal of Agriculture* each September. Through this the dairy pedigrees of all pure breeds of dairy stock are now available to breeders and farmers making their selection of stud stock; and each year the best lines of breeding animals are becoming more definitely known. Therefore, in whatever breed the beginner decides to take up, it is now possible to obtain reliable information on its dairy production at the offices of the Department of Agriculture; and the purchase of dairy-bred bulls can thus be accordingly made on fairly safe lines.

Loss by Cross-breeding.

Not only should the dairy record of the dams of the bulls be examined closely before the final selection is made, but the future sire must be of undoubted pure breeding. This is why the stud-breeding pedigrees are required of all animals submitted to these tests. Only pure-bred bulls will reproduce their dairy quality in the heifers with the desired uniformity, and no dairy farmer can afford to waste even one season in breeding calves from a cross-bred bull. It is not difficult to find a pure-bred bull whose heifers will give 50 lbs. of butter-fat per year more than the progeny of any cross-bred animal. It is this losing of 50 lbs. or more of butter-fat each year from each of the heifers and cows in the herd as long as they are kept which makes many a dairy farm unprofitable to work. Breeding better milking stock each season increases the profits year after year, and this can only be done by using pure-bred bulls of the best dairy pedigree. The Government herd-test records show where these high-class dairy bulls are bred, and the farmer can make his choice therefrom.

Value of a Pure-bred Bull.

The question is frequently asked, "What is the value of a good dairy bull?" The high prices paid for some of these animals may astonish those who do not look closely into the question. Most bulls will sire at least 50 heifers during their period of usefulness, and 30 lbs. of butter-fat is not at all a liberal estimate to make of the possible increase in the annual production of heifers as compared with that of their dams, consequent on good breeding. Assuming, then, only six lactation periods as the minimum average time these heifers would be kept in the herd, and with butter-fat selling at even 1s. per lb., the increased monetary return from using a well-bred dairy bull would not be less than £250. Such an increase is well within possible results if a proper selection of the bull is made. When it is also noted that these better milking stock form the basis of still further breeding improvement each year, it will be recognised that the actual value of a first-class dairy bull to any farmer who breeds his own dairy heifers may easily run to a very large sum of money.

How Loss Arises.

On the other hand, when it is realized that a bull bred from inferior milking stock, in most cases, will tend to reduce the dairy quality of the heifers rather than to improve them, and thereby cause much continued loss to the owner, it is strange that any one should question the wisdom of paying the price breeders ask for bulls from tested cows. It is quite an every-day occurrence to find in a dairy herd where no selection of the bulls has been made, that the best of the cows are the old ones, and the heifers are more or less of inferior milking quality; yet the owner does not grasp the fact that it is using cheap bulls that has cut down his dairying returns. When a selected dairy-bred bull may make a difference to the farmer of even £100 cash per year on the herd's production, it is very difficult to set a maximum limit on the value of that hereditary milking quality which a dairy pedigree expresses.

Striking Illustration of Dairy Quality.

As an illustration of this, we have the imported Jersey bull, Pretty Noble, owned by Mr. W. Woodmason, of Malvern, which sired 27 heifers, with an average of 290 lbs. of butter-fat in 273 days; the highest yield being 343 lbs. of butter-fat in the nine-months' term. Pretty Noble mated with Carrie 5th of Melrose (a 415-lbs. cow), threw the bull First Choice of Melrose, which was sold to the late C. G. Knight, of Cobram. First Choice was mated with eight cows, which themselves had an heifer average of only 244 lbs. of butterfat; yet eight heifers from these dams gave an average of 372 lbs. of butter-fat—an increase of actually 128 lbs. of butter-fat more in the 273 days than their dams made at the same age. This is remarkable evidence of better milkers being got from good milking cows by judicious mating.

One Breed and One Strain.

When breeding from pure-bred cows, or when grading up from cross-bred cows, no change of breed or strain should be made after the first sire has been selected. By continually grading up with bulls of the same blood, the fourth generation of heifers should be largely of the appearance of pure-bred stock; and their production will have also made very satisfactory advancement. It is almost impossible to make any definite headway by changing about to bulls of different breeding. Crossing breeds is a backward step which invariably makes for deterioration in the average production of the progeny. The continued use of pure-bred bulls from high-testing dairy stock is the safe road to progress.

Continual Progressive Selection.

The ideal dairy-farm cattle are those which combine good type and high production. In selecting breeding stock, type must always be given full consideration; for, as already stated, conformity to accepted dairy type insures a good constitution and the ability to produce big yields of milk. Although the selection of the breeding stock may have been made to the very best advantage at the outset, further systematic selection must be adhered to year after year to insure improvement. The grading up of the herd on its production must always be kept going by weighing and testing the yields of each cow regularly, and disposing of those animals which are least profitable. A matured cow should produce at least 250 lbs. of butter-fat in each lactation period. Forty-seven cows in the Government herd test have each more than doubled this yield in the 273 days' test; while over 500 tests exceeding 400 lbs. of butter-fat in nine months have been recorded. With such a number of high-class producers to obtain stud stock from, no dairy farmer should be satisfied to breed from a bull whose dam has not produced well above this 400-lbs. mark, especially when there are stock obtainable of a standard even 100 lbs. higher than this. Only heifers from cows exceeding the 250-lbs. mark should be kept for dairy work, and each year this standard could well be raised considerably, and the cash returns from butter-fat will then advance yearly.

Keep the Stock Growing.

All calves should be well reared and cared for from birth, and, unless of pure breeding and from first-class dairy cows, all the males should be sold as vealers, aiming to market them with that glossy appearance of the hair which is indicative of good condition.

De-horn the Heifers.

The heifers raised from the best cows for future dairy work—unless of show quality—will be as well de-horned when about ten days old, by treating the horn-buds with caustic soda. This should always be done when the calf is hungry, as the struggling for liberty on a full stomach may upset them considerably. Towards feeding time, they may be handled with safety; if fed half-an-hour later, the temporary rough handling is forgotten. This de-horning is done by first tying the calf's legs; then laying it first on one side and then the other, clip the hair off the horn-bud, and rub the bud gently with caustic soda until a small red spot shows in the centre of it. The caustic soda solution should be strong, and applied by means of a small piece of rag tied tightly on the end of a small piece of stick, about 6 inches long by ¼ inch thick, cut to a blunt point. Care must be taken that the solution does not touch the hands of the operator, or the skin of the calf, or a burn will result.

Handle Heifers while they are Young.

All heifer calves being raised should be kept in fair condition, neither fat nor yet allowed to get poor. With the heavier breeds, the heifers are mated from about eighteen months old; but with Jerseys, Ayrshires, and some of the heavist milking Friesians, the usual custom is to mate them at about fifteen months old. Heavy bulls should not be used with these younger heifers. As the heifers show signs of springing, it is as well to bring them into the shed occasionally, feeding and handling them there to get them used to the surroundings, so that when they calve there may be no trouble with them. It is not advisable to put forward heifers in with a herd of horned cows, as they are certain to get knocked about somewhat at first; but if they must be put to graze in the same paddock as the herd, they should be put through the shed in front of the older cows at milking time to avoid the bad treatment they would be certain to get if standing in the yard with the herd awaiting their turn. The handling in the shed before calving will accustom them to going into the shed quickly, and save much time when they come into milk.

Pure Stock.

There is no more interesting work in the whole range of farming than the breeding of pure dairy stock, and much added pleasure is certainly derived from developing and improving the quality of the herd when the profits are being increased at the same time. Those who are in the fortunate position to make stud-cattle breeding their hobby also frequently confer much benefit on their country generally. The spirit of friendly rivalry existing amongst breeders of each line of stock usually develops the desire to import cattle from overseas in the hope of improving those they already possess; and in this way first-class animals are brought in which prove valuable acquisitions to the State's dairy stock. But the beginner is under no necessity to look further than amongst the Victorian-bred cattle to find the highest class of producers. These, when fed well and handled properly, have shown that their dairy excellence is of the very highest standard.

A Close Study of Each Animal Requisite.

Definite rules cannot be laid down in regard to taking up or carrying on cattle-breeding, for the beginning is more frequently made in conformity with circumstances which are not all that could be desired, and with a very limited number of stock; while progress depends on foresight and pertinacity. The natural suitability of the owner for the management of stock will have very much to do with his success, for every animal in the herd will be found to have its own peculiarity of temperament; and, in order to succeed, the owner must be able to recognise this and handle the cattle accordingly. Close observation of every detail connected with the stock is therefore of highest importance; and the more quietly every animal is handled, and the more closely its treatment conforms to its individual peculiarities, the better will be the results. Some people have a natural aptitude for dealing with stock which is of very great assistance to them, and enables them to acquire further knowledge of cattle management without difficulty; but there is nothing, in either the rudiments or more advanced principles of stock-breeding, that should present much difficulty to master. Sustained enthusiasm in the work will carry every one to success. There is ample room for all breeds and all breeders. Any competition only makes for increased interest in all live-stock matters, which is to the advantage of all concerned.

Specialize to Attain Perfecfion.

The rules which govern breeding at this present date re largely the result of observations by the more successful breeders. The highest success with cattle has invariably been attained where the breeder has worked consistently for the improvement of one definite quality in either milk or beef production, rather than a combination of these. Excessive production in either of these will always be at the expense of the other. Where the aim has been solely for meat production, cows have been bred which do not produce enough milk to properly raise their calves; and with heavy milk production, the tendency is towards an exaggerated leanness in carcass. There are many instances amongst what are known as the dual-purpose breeds, where big-framed and somewhat fleshy cows have given very heavy dairy-produce yields; but this combination of quality is very seldom reproduced in their progeny, the balance going to one or other of these extremes in utility quality. Specialization in either milk or beef production will always detract from perfection in the other, the result being that dual-purpose breeds are largely made up of mediocre animals, which, in the case of dairy-farm stock, makes for anything but a high average milk yield.

Ideal Conditions of Site.

The ideal location for either stud-stock breeding or general dairy farming work is similar, and is represented by comparatively level or slightly undulating country, well sheltered in winter and shaded in summer, with fertile soil and good water supply. Whilst a combination of as many of these natural conditions as possible should be sought, the water supply is by far the most essential feature of all. Where either the quality or quantity of the water supply is at all doubtful, dairying will not be carried on with complete success, while failure may even occur in consequence. A good road, and a situation convenient to the railway station and market, are also strong factors to success; for all time lost on the road has to be paid for somehow, and may prove a big handicap. Excessively hilly country is not very suitable for dairying, even though the land be of good grazing quality, for the extra exertion the cattle have to put out in travelling militates against top milk yields; while the chances of injury to the udders of the cows are increased where the locomotion is difficult. Any strenuous travelling, exposure to excess in temperature as regards either heat or cold, or a water supply which is either limited, inaccessible, or unpalatable to the cows, will each act adversely on the milk yield of the herd; and these are conditions which must be guarded against.

Subdivision and Fencing.

A convenient subdivision of the farm land into comparatively even-sized paddocks will be of much assistance, since by resting the paddocks alternately as required the grass is kept clean and fresh, with the result that the stock thrive better, and the actual carrying capacity of the farm is increased. All fencing and gates should be kept in good repair. Insecure fencing may result in injury to the stock through fighting, loss through cattle straying, or a season's work being disorganized by a mongrel bull getting amongst the herd. Disease may also be transmitted to the stock through wandering cattle, and cows frequently injure the udder in getting through broken fencing; whilst on the boundary of the farm, bad fencing is certain to cause trouble with the neighbouring farmer. By keeping all fencing and gates secure, much annoyance will be prevented, as well as possible loss.

Water Supply can be Improved.

Where the water supply is not convenient for the stock, it will pay to improve it to its utmost; and nothing is more satisfactory than the wind-mill and trough if the water is below the surface level; while a pipe and trough below the dam or spring which is fenced off from the stock will make all the difference between a satisfactory supply and the reverse. Stock should not be allowed to wade where they will foul the water, as this is almost certain to affect the keeping quality of the milk and cream.

Tidiness is Profitable.

Dairy buildings need not be elaborate, so long as they protect from the weather, keep stock in or out as required, and have impervious floors and drains to allow of the place being easily kept clean and dry. Where there is ample shade and shelter from heat cold winds and rain, the stock are more contented, and consequently thrive better; while all tidiness and systematic arrangement of yards, gates, buildings, cultivation paddocks, dams, &c., makes for convenience of working, and cheapens the cost of production. Anything that is inconvenient in the working of the farm should be remedied as soon as possible. Time is just as valuable to the farmer as to the banker, lawyer, or other business man. There are very few farmers who recognise this fact in either the general working of the place, or in the hours wasted in watching mongrel stock changing hands in the sale-yards. Any sale will draw a crowd, while many an instructive address on farm practice has lapsed for want of an audience. Time is the most ill-considered asset of the farmer.

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SHEPPARTON CROP AND FALLOW COMPETITION.

Report by the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer, Department of Agriculture.

By the adoption of this valuable method, both of discovering the best local farming practice, and of fostering its spread, the Shepparton Society has demonstrated that it is ready to move with the progressive spirit of the times, and do more to improve the standard of agriculture in the district than merely hold an annual show.

For several years past practically the whole of the agricultural societies in the Wimmera have conducted annual crop and fallow competitions, and find them of great practical benefit in improving local farm practice. For some reason, the idea has been slow to spread in the Goulburn Valley, but indications are not wanting that, shortly, the competition method will be adopted by all the leading agricultural societies there too. This year Elmore, Shepparton, and Dookie have pioneered the way.

Raising the Yield per Acre.

The first step towards obtaining increased crop yields in any community is not so much a question of immediate change of method as of mind. Experience shows that it is the mental attitude of the people that largely determines the rate of progress. Without a firmly-established belief that more payable results follow better methods, and that better methods can be discovered, little improvement can be hoped for. The widespread belief in the power of man to rapidly improve the yield of wheat by the discovery and use of more perfect methods is a characteristic of the Wimmera people. And who will say that the spirit of healthy optimism there has not borne fruit? The Statist's figures for the average wheat yield there for the past twenty-five years, comparing five-year periods at the beginning and the end, show the remarkable increase of 12.9 bushels per acre, *i.e.*, 169 per cent. The yield has been raised from 7.6 bushels per acre to 20.5 bushels per acre.

To-day there are those who talk of a 60-bushel crop era for the Wimmera. Far from being looked upon as incurable optimists, they may be regarded as rendering public service

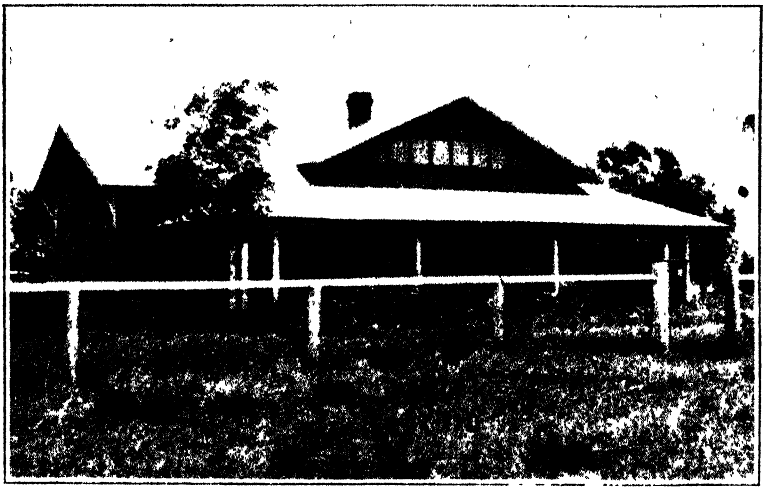
While the Wimmera average wheat yield has been increased by 169 per cent., the yields in the northern district, including the Goulburn Valley, have increased only by 2.9 bushels per acre, *i.e.*, from 10.4 to 13.3 bushels per acre, or by 28 per cent. Do the present averages constitute the limit for the Goulburn Valley? If not, how far are they to be increased? Undoubtedly the first step forward must be the general recognition that present methods can be largely improved upon. Then the rest is comparatively easy.

THE COMPETITION.

Messrs. Furze and Jacobs, of the *Shepparton Advertiser,* with commendable enterprise, donated the principal prize. The entry was good —24 crops and 15 fallows—but the area of crop submitted to the judge —20 acres each entry—was too small to enable a very accurate examination to be made of the growers' general methods. There was too much room for the selection of small patches of crop whose superiority may be due to conditions outside the control of the farmer.

The competition embraced farms within a radius of 20 miles of Shepparton. It resulted in crops grown on the red loams at Dookie or at Toolamba competing with those on the cementy soils, with heavier rainfalls, as at Tamleugh and Karamomus, and again with those on the grey clay loams at Congupna and Tallygaroopna.

The dry season permitted of some excellent crops being raised in country which is normally too wet in winter for good results with wheat. It also favoured those crops grown on loamy ground as compared with those raised on the grey clay loams. In another year it might be desirable to invite entries for the crops and the fallows classified according to the class of soil on which they are grown. Probably two subdivisions would suffice.



Comfortable Farm Residence of Mr. T. N. Flight, Toolamba.

The week's tour enabled acquaintance to be renewed with the soils and methods of the district. The crops, except those at Toolamba, Arcadia, Karamomus, and Tamleugh, had suffered from the effects of the dry season. At Dookie, the rainfall for the year was only 10.63 inches, and at Shepparton it was 14 inches. The autumn and winter months were exceptionally dry, the early spring rains satisfactory, but November rains were absent. Except in the districts named, most of the crops were characteristically short, thin, and late. The thinness was due in part to the moderate dressings of seed applied locally, but in the main to poor germination. The autumn working of the fallows left them dry, too finely pulverized, and too deeply worked. Dry sowing was in many cases resorted to, especially where the farmer also had some stubble land to plough and sow. When rain came the soil cemented down with damaging effect on the germinating grain. But dry as the season was, there is no doubt that far better average results would have been obtained had all used the best methods. The free working loams, especially at Dookie, can be worked precisely like Wimmera soils, and that involves a great deal more cultivation than is at present given them. The grey clay loams present special problems of their own, in that injudicious cultivation may reduce them to the dust-like powder which is fatal to good germination and subsequent healthy growth of wheat.

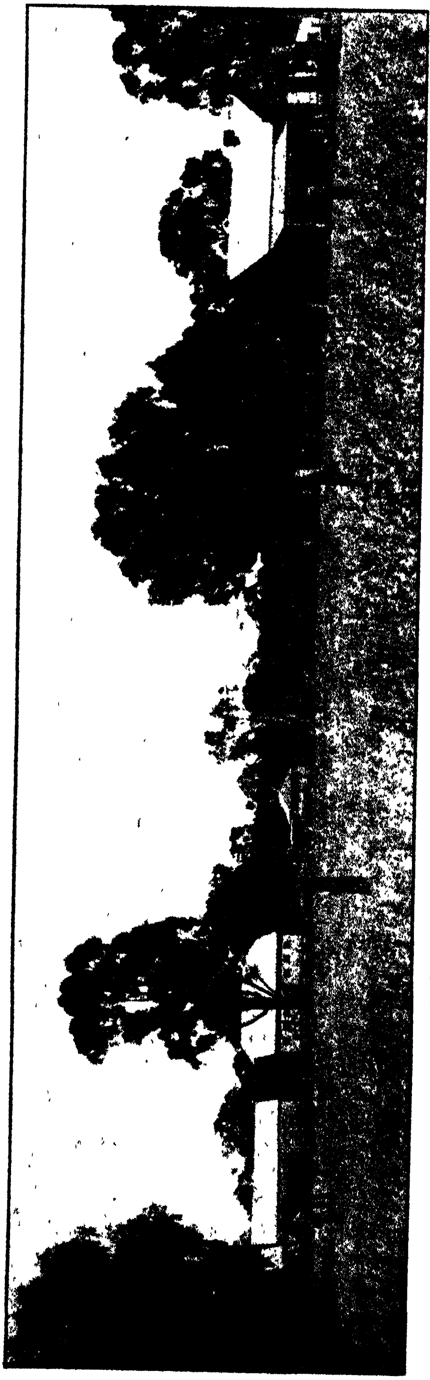
With respect to varieties, Major and Minister, both bred by Mr. Pye, at Dookie College, appear to have practically displaced Federation here. Of the Dookie wheats, Major is the most popular. It would be of great interest to have a comparative test locally of improved Federation made alongside Major. The average dressing of seed used locally is about 60 lbs. per acre, with a similar quantity of superphosphate. May is the popular seeding month. Many farmers sow about one-third of their wheat on stubble land. On the average the fallow is worked thus:—Ploughed 4½ inches deep in August and September, harrowed and cultivated in the spring, disced after harvest, spring-toothed ahead of the drill and sown.

Results.

Best Wheat Crop, 20 Acres.

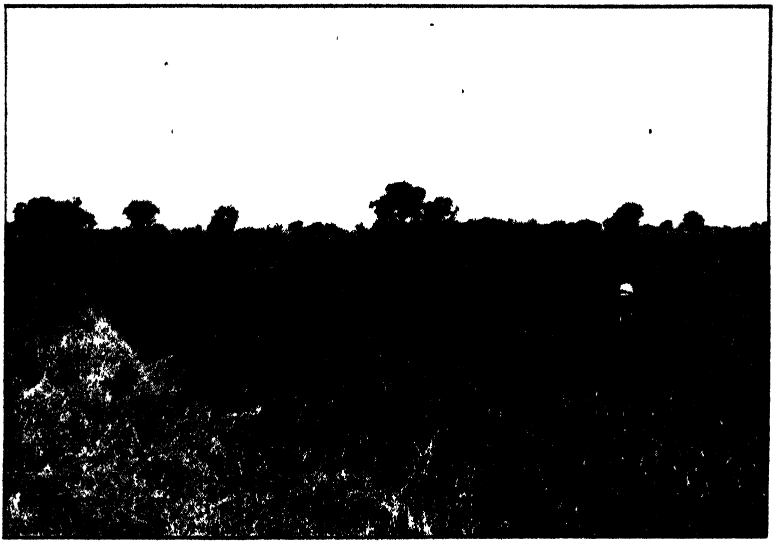
The crop of Major wheat entered by Mr. T. N. Flight, of Toolamba, was awarded first prize, with a total of 95 points. Mr. L. Brown, of Tamleugh, gained 94 points and second prize, also with Major. Messrs. Bennett Brothers' crop of Minister, at Dookie, was placed third with 91 points. Highly commendable entries were also submitted by Messrs. Kittle Brothers, Arcadia (Major), and by Mr. T. J. Mellerick (Minister).

The winning crop, representative of 50 acres, was a magnificently grown one, if anything too tall, but very dense and regular throughout.



Residence and Farm Buildings of Messrs. Kittle Bros., Arcadia.

It was well-headed, fairly true to type, and clear underfoot, save for an odd saffron thistle. Altogether it was a remarkably heavy crop for the season. It was grown on a superior red clay loamy soil, which had been out in natural grass for six or seven years. The land was fallowed in July and early August to 4 inches deep, and then harrowed, and left in a mellow condition till after harvest, though it was "sheeped" when required. The fallow was disced shallowly in March, spring-toothed, rolled, and sown dry towards the end of April with 60 lbs. seed wheat and 112 lbs. of superphosphate. In the same paddock was 45 acres of Minister almost equally well grown. Attention has already been drawn to the fact that this crop evidently received considerably more rain than the average of those inspected elsewhere, but factors which must have contributed to the fine result are the early ploughing, the maintenance of a clean mellow surface on the fallow throughout the year, and the heavy application of fertilizer used.



The Winning Crop (Mr. T. N. Flight's), Toolamba. Variety, Major.
Grown on well-worked fallow; 112 lbs. of superphosphate per acre used.

The crop placed second was grown on light grey soil, on rising ground, within 13 miles of Violet Town. Like the winning crop, it was thick and tall. It was notable for fine bold heads, quite free from weeds, but was not so regular throughout as that of Mr. Flight.

The land, which had been out in grass for some years, was ploughed in August to 4½ inches deep, and left in the sod. The following May it was disced very shallowly after rain, and drilled with an 8-inch drill, and harrowed. Sixty-five lbs. of wheat was used with 56 lbs. of superphosphate. The Tamleugh district receives a heavier rainfall than Shepparton. The treatment given the fallow is more suited to the soil and conditions at Tamleugh than it is in the drier parts of the district

Messrs. Kittle Brothers' crop at Arcadia was portion of a fine paddock of Major wheat, some 100 acres in area. The apparent yield was good, the crop fairly free from strangers, but some wild oats were present, for which points were deducted. The land was ploughed to 4 inches deep in July, and harrowed across the ploughing two weeks later. In October it was disced shallowly, and again in March. Early in May it was harrowed after rain, and then drilled, using 60 lbs. of seed with 60 lbs. superphosphate.

Mr. T. J. Mellerick's crop of Minister, also a heavy one for the season, is worthy of notice as having been sown on fallow which had been worked over twice in the spring with the rigid-tined cultivator. It was sown during the first week in May, and though 70 lbs. of seed per acre was used, the crop was somewhat thinned by faulty germination. Evidently the discing preceding the seeding had been somewhat deep. Seventy lbs. of manure were used. A tall crop of Bomen wheat was also entered by the same competitor, but was thin, apparently from the same cause.

Best Wheat Crop of 20 acres.

DETAILS OF POINTS AWARDED.

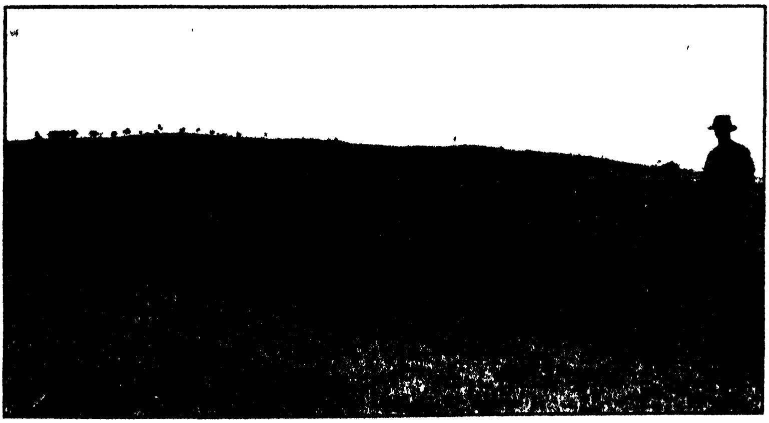
Competitor	Variety.	Yield.	Trueness to Type.	Absence of Weeds.	Absence of Disease.	Evenness.	Total.
Possible Points		**35**	**20**	**15**	**15**	**15**	**100**
F. N. Flight	Major	35	17	13	15	15	95
L. Brown	Major	34	18	14	14	14	94
Bennett Bros.	Minister	29	18	15	14	15	91
Kittle Bros.	Major	33	18	11	13	15	90
T. H. Flight	Minister	32	15	11	13	14	85
T. J. Mellerick	Minister	27	18	12	13	14	84
M. Lowry	Major	26	18	14	15	11	84
E. H. Wright	Minister	23	16	15	15	15	84
Bennett Bros.	Major	27	16	10	12	14	79
T. J. Mellerick	Bomen	25	19	8	14	12	78
M. Lowry	Minister	23	17	12	15	10	77
M. J. Breen	Federation	21	18	10	14	13	76
H. Fletcher	Minister	23	15	11	12	14	75
T. H. Roe	Major	25	17	11	9	12	74
Robison Bros.	Federation	24	16	9	9	15	73
J. Leahy	Major	24	14	12	11	10	71
E. H. Wright	Federation	18	16	14	10	13	71
W. R Vincent	Yanward	11	19	13	14	14	71
H. Graham	Canberra	15	19	12	12	12	70
H. Fletcher	Red Russian	22	17	9	7	13	68
H Graham	Dollar	21	19	5	8	12	65
J. McNab & Vincent	Dollar	15	19	13	7	11	64
M J. Breen	Major	14	16	8	11	14	64
W. R. Vincent	Major	17	14	9	11	11	62

Results—Fallows.

In judging the fallows, each was tested with a spade in separate parts, and points were awarded for the apparent moistness of the under soil, for the character of the loose surface soil, and its general effectiveness as a preventive against evaporation, for the absence of weeds, and for the general thoroughness and judgment with which the implements had been used, as indicated by regularity of the depth of cultivation, the consolidation of the seed bed, &c. Some difficulty was experienced in making fair comparisons, because the varying soils entered in some cases required quite different treatment.

The results were:—Messrs. Bennett Brothers' No. 2 entry, first place, with 95 points; Mr. W. A. Trewin's fallow, and Messrs. Bennett Brothers' No. 1 entry equal for second with 94 points; Mr. T. J. Mellerick, third, 93 points. Then follow Messrs. Bennett Brothers' No. 3 entry, Mr. A. R. Vincent, and Mr. T. H. Roe.

Heavy Crop of Major Wheat, grown by Mr. L. Brown, Karamomus. Awarded 2nd prize.)



Excellent Crop of Minister Wheat, grown by Messrs. Bennett Bros. (Awarded 3rd prize.)

Messrs. Bennett Brothers' No. 2 entry comprised 50 acres of the friable black clay loam on the flats near Dookie; it also contained some patches of red loam. The texture of the soil is such that it can be summer fallowed. The paddock was disced shallowly in March, dry, and in August ploughed shallowly. Subsequently it was harrowed in September, spring-toothed in October, then harrowed—all after rain. Digging with a shovel showed the soil at a depth of 9 inches so moist that it could be moulded in the hand—a tribute to the skill of Messrs.

Bennett Brothers' method of fallowing, which is now based on Wimmera style. Messrs. Bennett Brothers' No. 1 entry was a red loamy soil on the slopes of a hill. It was ploughed to 3½ inches deep in August and September, then harrowed in September, and again in October, after rain. Messrs. Bennett Brothers' policy is to harrow after every rain of consequence, with the object of preserving the mulch, and so retaining the moisture.

Mr. W. A. Trewin's fallow was located at Tallygaroopna, on reddish land of loamy texture. Mr. Trewin believes in thorough cultivation of the fallow, and "takes as his pattern the gardener." The moisture content was satisfactory, the mulch of loose soil 3 inches deep wherever tested, and there was evidence that the cultivation implements had been carefully manipulated. If anything, the texture of the mulch was rather fine for the class of soil. The following working was given:—Ploughed in July to 5 inches deep, harrowed, rolled in September with spike rollers, and disced early in October.

Judging the Winning Crop.

Of special interest was Mr. T. J. Mellerick's fallow at Arcadia. The soil was a red clay loam. It was ploughed in June to between 5 and 6 inches deep, harrowed in July, cultivated with the rigid-tined cultivator in July, disced first week in September, spring-toothed at end of September, and then harrowed. The mulch was of mellow texture, and regularly disposed, and not too fine. The cultivation had been well done, and the seed-bed well consolidated at about 2½ inches below the surface. The use of the rigid-tined cultivator is of interest, because it will do work which is intermediate between the spring-toothed cultivator and the disc; hence weeds can frequently be cut, and the surface kept loose without recourse to the disc cultivator. The moisture in this fallow appeared somewhat deficient.

Mr. A. R. Vincent's fallow had been prepared almost solely with the disc cultivator. It was disced in July, again in part at the end of August, then harrowed; disced again in October, and then harrowed.

Interesting comparisons will be available next year, when the crops grown on these fallows are judged.

Highest Aggregate for 50 acres of Fallow, 1922, and for the Crop on the Fallow, 1923.

DETAILS OF POINTS AWARDED FOR FALLOW.

Competitor	Moisture	Mulch.	Weeds.	Cultivation.	Total
Possible points	**25**	**25**	**25**	**25**	**100**
Bennett Bros. No. 2 ..	25	23	23	24	95
W. A. Trewin	22	23	25	24	94
Bennett Bros. No. 1 .	24	23	24	23	94
T. J. Mellerick ..	21	24	24	24	93
Bennett Bros. No. 3 .	22	22	23	23	90
A. R. Vincent .. .	21	21	24	23	89
T. H. Roe . .	20	24	24	21	89
Jas. Phillips .	21	22	25	20	88
W. Ross .	21	20	25	21	87
A. E. Dainton .. .	20	21	25	20	86
R. Pogue & Sons. .	20	19	25	19	83
McNab & Vincent .	21	20	20	21	82
— Kerr	23	21	19	19	82

Heavy Crop of Major Wheat.

Working Goulburn Valley Fallow.

There can be no question that careful cultivation of the fallow plays as fundamental a part in the growth of a successful crop of wheat in the Goulburn Valley as it does in the Wimmera. Comprehensive reasons were advanced in the report furnished the Elmore Society why the stubble sowing of wheat must be abandoned in the Goulburn Valley if the yields and the profits are to be enhanced. At the Rutherglen Experiment Station, on fairly poor grey soils, for a period of six years, the yield of wheat grown on land ploughed just before seed time, averaged 12 bushels per acre. Where the land was July-fallowed, and cultivated in the spring, and again in autumn, the average yield was

18.4 bushels per acre. That implies, for this class of land, an 18.4 bushel average for the farmer who sows all his wheat on fallow, and a 16.2 bushel average where one-third of the wheat is sown on stubbles. But on the better soils at Shepparton, it would be quite safe to infer that still greater comparative increases from fallows would result. Once the cost of production is met, it is the extra bushel or two that gives the profit.

In the working of the fallow there is no justification for a slavish emulation of Wimmera methods, except on soils of similar texture. These occur at Dookie on the black flats, and again in any really free-working red loams. The methods likely to give best results for these soils were outlined in the Elmore report. On the balance of the land, and, so far as Shepparton is concerned, the greatest proportion, the nature of the soil is obviously different from that of the Wimmera. It is more allied to some of the red clay loams there, which do not present any difficulty in being consolidated, but which, on the contrary, tend to set down tightly very rapidly after rain, and hence present difficulties in being maintained in satisfactory tilth. When repeatedly worked over, especially if dry, and particularly with the disc cultivator, they are readily reduced to a fine flour-like condition, which is not a satisfactory germinating medium for grain, nor when cemented down by rain to a flat condition later on, is it suitable for the growth of thrifty plants.

Excellent Fallow—Mr. T. J. Mellerick's, Arcadia.

(The excellent condition of this fallow was largely due to the use of the rigid-tined cultivator.)

Depth of Ploughing.

The standard depth of ploughing these soils has for years been about 5 inches deep. But following Wimmera practice for black soils there are those who are now ready to believe that much shallower ploughing would pay better. Their views do not receive any support from the cultivation tests conducted at Rutherglen. For a six-year period the half-acre plots ploughed to various depths, and sown with Federation wheat, gave the following average results:—

	Bushels per acre
Ploughed 3 inches deep in July, and cultivated ..	15.6
Ploughed 5 inches deep in July, and cultivated ..	18.0
Ploughed 7 inches deep in July, and cultivated ..	19.3
Ploughed 9 inches deep in July, and cultivated ..	19.1

So that, apparently, the deeper the ploughing, up to 7 inches, provided the subsoil will permit, the higher the yield. Of course, the increase obtained by the very deep ploughing does not justify the extra labour involved, but the test shows a very definite trend. Shepparton wheat-growers then, on this class of soil, should look to it that a good 5-inch depth is maintained.

It has been urged that subsoiling to greater depths would permanently increase the yields to an extent that would justify the high cost, but tests made at Rutherglen do not support that view either. A series of plots similar to those just quoted have been subsoiled to 18 inches in addition to the usual ploughing. An increased yield was obtained, but a very slight one where the depth of ploughing was over 3 inches. Even here the influence of the depth of ploughing can be noticed. It has not been masked by the subsoiling.

Sheep Grazing Lucerne at Mr. T. N. Flight's, Toolamba.

	Bushels per acre
Ploughed 3 inches deep in July, subsoiled, and cultivated	18.2
Ploughed 5 inches deep in July, subsoiled, and cultivated	19.7
Ploughed 7 inches deep in July, subsoiled, and cultivated	20.4

Time of Ploughing.

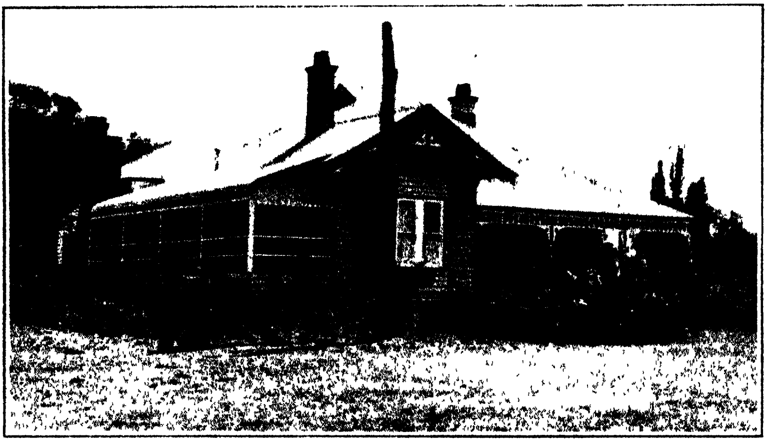
Valuable guidance is also furnished by the same series of experiments on the time at which the land should be fallowed for the best results. Wheat (Federation) has been grown on land fallowed to a depth of 5 inches deep in July. Alongside each year was a crop of the same variety sown on the same day, and with the same quantity of dressing of seed and manure, on land fallowed to 5 inches deep, but in

October. Both fallows were kept cultivated. The following is the result of the average for six years:—

	Bushels per acre
Ploughed 5 inches deep in July, and cultivated ..	18.4
Ploughed 5 inches deep in October, and cultivated	15.8
Increase due to early ploughing	2.6

Further than that, a test was also made to determine the effect of subsequent cultivation on land ploughed early, and on land ploughed late. The following are the average results for the six years:—

	Bushels per acre
Ploughed 5 inches deep in July, and cultivated ..	18.4
Ploughed 5 inches deep in October, and cultivated	15.8
Ploughed 5 inches deep in July, and not cultivated	15.3
Ploughed 5 inches deep in October, and not cultivated	15.6



Farm Residence, Shepparton.
(Note sleeping-out accommodation.)

In other words, it is of little advantage to plough early if it is not intended to cultivate the land afterwards and, further, if the ploughing is late, no amount of subsequent working can compensate for the original delay.

The whole of these results are based on carefully conducted tests, in which the yield of each half-acre plot was harvested and weighed. They ought to be a reasonably accurate guide to Goulburn Valley wheat-growers on the more refractory soils, at any rate until disproved by tests made locally.

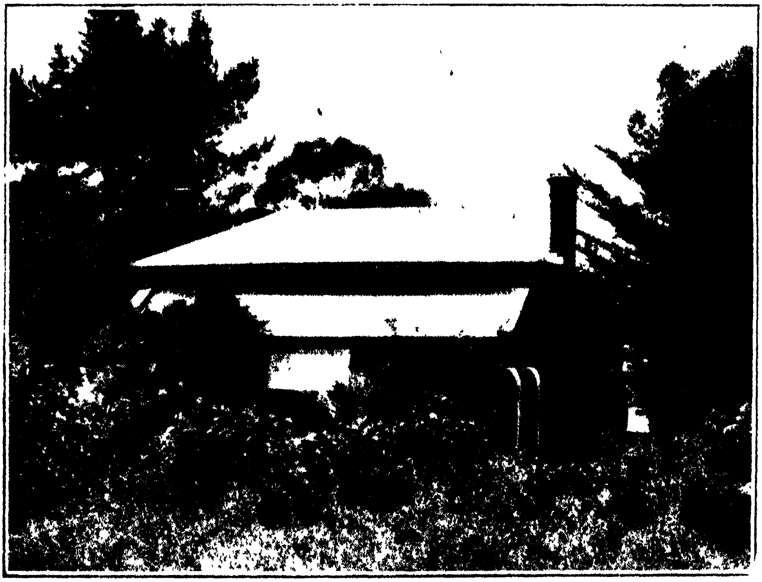
With respect to the working of the fallow on this class of land, there is, unfortunately, no such definite evidence available. Until tests are made, the best method of treating them must remain a matter of opinion.

The objects of working the fallow are quite definite—the method of best achieving them another matter. Weeds must be destroyed, a seed bed prepared, but, above all, moisture must be retained in the under soil from spring through the summer for the benefit of the next crop, and for the purpose of allowing the processes of plant food formation to proceed at their maximum. A dry, cloddy fallow is an idle factory, whereas a moist fallow is a hive of industry. The difficulty which attends the maintenance of a satisfactory mulch on the refractory Goulburn Valley wheat land arises chiefly from its tendency to set hard quickly after wetting.

Great things were once hoped from lime as a soil amendment on these soils. Repeated heavy applications made at Rutherglen have produced results of the following order:—

	Average of 6 years.
Super., 1 cwt. per acre	15.7 bushels per acre
Super. 1 cwt., and lime 5 cwt. per acre	17.0 bushels per acre

The lime was applied each year.



Home of Messrs R. Pogue and Sons, Toolamba.

Wherever the lime has to be carted and railed any distance, and is therefore costly, there is no great incentive to put it on, if results of that order only are to be obtained. But there is lime at Cosgrove, which is cheaply obtained, and which, at any rate, should pay to top-dress on wheat land in the immediate vicinity. Astonishing results have been obtained during the past two years with gypsum on cementy soils in the western Wimmera. Perhaps this is the soil amendment for which wheat-growers in the Goulburn Valley are looking. Until the duration of the effect of gypsum is tested over a period of several years, and the facts obtained, there remains nothing but the treatment of the fallowed land with more judgment and with more suitable implements than those commonly used. Fallows should be worked over rapidly after rain with an implement capable of covering the ground quickly to kill small weeds, and to maintain the surface mulch to a depth of from 2½ to 3 inches, and yet not pulverize the soil. The spring-tooth, though satisfactory when weeds are young and the soil light, does not fill the bill entirely. The disc cultivator, though essential for killing weeds and thistles that have got out of hand, and for working up neglected fallow, has the great drawback that it powders the land too fine, leaving the clods below, and that it cannot be maintained at a regular depth. Besides these regular implements, Goulburn Valley farmers badly need a cultivator of a type midway between the two named. There are two that suggest themselves—the rigid-tined cultivator with weed-cutting attachment, and the modern Wimmera type scarifier. These implements will cut weeds better than the spring-tooth, and having stronger feet will turn up crusted fallow better, and do not pulverize the soil too much. Public trials of them should be fostered by the agricultural societies interested. A more rapid method of draught than horses would be an advantage, and that opens up the question of tractors.

If more prolific wheat crops are to be obtained in the Goulburn Valley, apart from the need of good fallow, it is probable that more seed per acre should be sown, and more superphosphate must be drilled in. On well worked fallow 75 lbs. of seed per acre is not too much to apply, with 112 lbs. of superphosphates. The winning crop was manured at that rate.

BENALLA CROP AND FALLOW COMPETITION.

Report by Judge, P. B. O'Keefe, Manager, State Farm, Rutherglen

Judging took place on the 11th December, which was rather late, one competitor having completed harvesting, and another had partly harvested his area. This being the first competition of its kind held in Benalla—in fact, the first in the north-east of Victoria, a live interest has not yet been aroused among farmers, and the number competing was limited to three in the crop and fallow section (Mr. F. Hall having withdrawn his crop), and two in the crop competition. However, great things often owe their existence to small beginnings, and the president and secretary of the society take an optimistic view, and hope to have a much greater number competing in future. Many farmers, apart from those competing, also expressed their intention of entering the arena next year.

Even with the small number of crops judged, the object for which the competitions are held was to some extent achieved, as in each section the winning crop was very good, considering the season, and in striking contrast with the average crops seen in the district. This proves that there are methods of farming which will produce payable crops under very trying conditions. One way to ascertain what these methods are is to study the practices of farmers who consistently produce better crops than their neighbours.

Benalla is a district of relatively heavy rainfall. It may be argued, therefore, that fallowing is unnecessary. Some local farmers, whose opinions must be respected, find the yields after fallow much improved, and wisely argue that if there is any disadvantage at all it is the loss of the use of the land for grazing during the period it lies fallow, which is from, say, July or August in the year of fallowing to April or May, the month of seeding in the following year. They hold that, during most of this period there is ample feed on the farm due to the natural spring growth, followed by the stubble from harvested crops. Thus with a proper system of rotation the loss of the grazing from fallowed area may be written down to a low figure, whilst the benefits gained are very apparent.

Some Advantages of Fallowing in the North-East.

(1) Fallowing may be done at a slack time, and when the land is in a suitable condition for deep and thorough ploughing. Under these conditions the maximum area may be ploughed per day with a minimum of labour, horse flesh, and wear and tear.

(2) Fallowing, followed by proper cultivation, conserves the soil moisture for the use of crops at a period when they most need it, for even in heavy rainfall districts dry periods frequently occur, when moisture in the soil is a valuable asset.

(3) The clay lands in the north-east of Victoria have a tendency to bind and set down hard; there is nothing which overcomes this trouble so effectively as a deep fallow cultivated at the right time, and in a proper manner.

(4) In the north-eastern districts the autumn rains are often delayed sometimes until the end of May, and, in extreme cases, until June. When once the break comes, rain usually sets in, and continues, more or less, right through winter, leaving only a very limited period and that broken time, during the shortest days of the year, to prepare and seed land. The farmer with an area of well-worked fallow not only reaps a benefit from the sprouting of wild oats, thistles, &c., and turning them under to insure a clean crop, but also he is safe to plant at his leisure right along from the beginning of May, whether rains fall or not.

(5) The main value of fallow tillage, however, is that of providing the most suitable conditions in the soil for the vigorous operations of germ-life in the surface layers of the earth. This enables them to break down and render available for succeeding crops the vast stores of plant food which, but for such bacteria, would to a large extent continue to lie dormant in the soil.

THE COMPETITION.

No. 1 SECTION—BEST AREA OF WHEAT, NOT LESS THAN 30 ACRES, GROWN ON 1921 FALLOW.

In this section, entry No. 1 of Mr. D. Smith, of Goorambat, was placed first with a total number of 168 points out of a possible 200, and Mr. Henry Hill, of Stewarton, second with a total of 165 points.

The winning crop was a 50-acre paddock of "Joffre." It contained a large number of strange heads, for which points were heavily deducted. Very few weeds were present, and only an odd plant showing signs of flag smut, and a very odd head showing ball smut were to be noticed. This crop, in common with practically all of those inspected, was uneven, due mainly to the varying quality of the soil, and the lodging of surface water on the lower levels. The unevenness was very pronounced in the length of straw, but not so pronounced in the length of ear. However, the shorter portions looked like yielding heavily.

The crop was grown on land which produced its last wheat crop in 1918, after which it was left out to pasture until it was fallowed to a depth of 5 inches in August-September, 1921. Sheep were allowed access to the fallow until February, 1922, when it was cultivated with a one-way disc. It was allowed to lie in this condition until May, when it was spring-toothed, harrowed, and seeded, 60 lbs. pickled seed and 80 lbs. superphosphate being used.

Mr. Henry Hill's crop of Major, grown on a 30-acre field, was reasonably true to type, showing only a small number of strange heads. It was fairly even, considering the varying quality of the soil, &c., but showed a heavy sprinkling of wild oats.

This field was sown with wheat in 1920, fallowed to 5 inches deep in October, 1921, was harrowed, disced, and spike-rolled about the end of November, harrowed again about February, and left lie until the end of May, when it was spring-toothed and drilled, 60 lbs. pickled seed and 90 lbs. superphosphate per acre being used.

The crop awarded third place was Mr. D. Smith's No. 2 entry, which was a 50-acre paddock; 25 acres was sown with Minister, and 25 acres with Major; the whole scored a total of 142 points. Both areas contained a few ears of barley and strange wheats, also a sprinkle of wild oats throughout, the Major portion being the cleaner of the two. The crop generally was poor and light, and appeared to justify the comments of the judge in his report, on this field, in the fallow competition. This land was cropped with wheat in 1919, with oats in 1920, fallowed 5 inches deep in September, 1921, and allowed to lie until March following, when it was harrowed, and run over with a spring-tooth cultivator; was again harrowed in May, prior to being drilled with 60 lbs. pickled seed, and 80 lbs. super. per acre. The growing crop was harrowed and spike-rolled in August, and was not fed off.

Details.

SECTION 1.—FOR BEST AREA OF WHEAT, NOT LESS THAN 30 ACRES, GROWN ON FALLOW WHICH COMPETED IN FALLOW COMPETITION, 1921.

—	Variety	Yield	Trueness to Type	Freedom from Disease	Absence of Weeds	Evenness	Total for the Crop	Total for Fallow	Grand Total
Possible Points	..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
D. Smith, Entry No 1	Joffre ..	28	15	14	14	13	84	84	168
Henry Hill	Major ..	26	18	14	11	14	83	82	165
D. Smith, Entry No. 2	Major and Minister	19	17	13	11	12	72	70	142

SECTION 2.—BEST WHEAT CROP, NOT LESS THAN 30 ACRES.

In this section, Mr. Richard Lindsay, of Stewarton, was placed first with a total of 90 out of a possible 100 points. His was a very heavy crop, true to type, and showing only a very odd strange ear, free from wild oats, &c., the only weeds noticeable being a small patch of spear grass close to a headland, apparently where the plough had risen. A small amount of flag smut was noticeable.

The paddock, comprising a red loamy bank and grey clay soils, was sown half in oats and half in wheat in 1920, and was fallowed 4 inches deep in August-September, 1921. The red soil portion (about 15 acres) was cultivated, and planted with millet and 30 lbs. superphosphate per acre about the end of October, 1921. The balance of the field was harrowed at the same time, and again late in January, after rain. After the millet was fed off, the whole field was cultivated with a spring-tooth cultivator early in May, and sown with 75 lbs. pickled seed, along with 85 lbs. superphosphate per acre. The rough patches of land were then rolled with plain roller, and the whole area harrowed. This was easily the best crop inspected, and the treatment given the soil, particularly the grey clay, appeared to be the nearest approach to what is desirable under the conditions prevailing at Benalla. The soil under the crops still showed a nice cloddy condition, and was free from that hard, unyielding surface, which is noticeable in the clay soils of the north-east when they are not carefully tilled. It appeared that judicious feeding off with sheep of the red soil portion of field in the early stages of its growth would have reduced the bulk of straw, and possibly increased the yield of grain.

Mr. Henry Hill's crop, which also competed in this section, comprised four different varieties of wheat, viz., Major, Yandilla King, Federation, and Minister. Portion of the Major showed up well, but was very light in places, and generally uneven. Part of the area appeared to suffer through faulty ploughing. It contained a sprinkling of strangers and thistles, and some take-all and ball smut were noticeable. The Yandilla King portion, a small area, was fairly even, true to type, and free from weeds. The Federation and Minister were uneven, and generally unattractive, showing a few strangers, and the last-mentioned variety had lodged in parts.

The field was sown with wheat in 1919, was fallowed from 3½ to 4 inches deep in October, 1921, harrowed in February, 1922, cultivated with spring-tooth cultivator in May, and seeded with 75 lbs. pickled seed, except in the case of the Yandilla King, where 1 cwt. of superphosphate was allowed per acre. The crop was not fed off.

Details.

SECTION 2—FOR BEST WHEAT CROP, NOT LESS THAN 30 ACRES.

——	Variety.	Yield.	Trueness to type.	Freedom from Disease.	Absence of Weeds.	Evenness.	Total
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
Richard Lindsay ..	Major	30	19	14	14	13	90
Henry Hill ..	Major, Yandilla King, Federation, Minister	23	19	12	13	13	80

A feature of the competitions was the number of varieties of wheat grown. In the crops judged there were no less than six different varieties. This would indicate that district farmers are anxious to ascertain definitely, and at their own expense, the most suitable variety for their district. In the instance under review the bulk of evidence appeared to be in favour of Major. Experimental work of this kind, however, is too expensive for the average farmer, and a great deal to assist wheatgrowers might be done by the local agricultural society co-operating with the Agricultural Department in conducting, on a small scale, experimental plots. The tests I would suggest are as follows:—

(*a*) Variety trials where, say, ten different varieties could be tested.
(*b*). Fertilizer trials.
(*c*) Rates of seeding trials.
(*d*) Time of seeding trials.

There still remains a large field for exploitation by farmers themselves in the following:—

(1) Judicious feeding off with sheep of crops in the early stages, when they are making too rapid growth; this especially in tall-growing varieties.
(2) Rotation of crops including pasture for sheep, thus keeping in check wild oats, thistles, weeds, &c., of all kinds, and avoiding excessive cultivation with the consequent plough-sickness of the land.
(3) The use of pure, selected seed wheat of the most prolific varieties.
(4) The ploughing of low-lying areas in narrower lands, with furrows running with the natural fall of the land. The making of surface drains to prevent, where possible, water running into cultivation paddocks, or in those cases where depressions run right through the centre of fields, to make drains at the lowest points to prevent stagnation and drowning of crops.

More attention might also be paid to a system of more careful and thorough pickling of the seed.

* * *

HOUSING POULTRY.

By W. C. Rugg, Poultry Foreman, Werribee Research Farm.

Site.

The best site for the poultry yards is a slope with a north-eastern aspect, having a clear opening through which the morning sun may reach the yards. Good drainage is essential, as poultry will not thrive on heavy wet soil; sand or sandy loam is undoubtedly the best, though, of course, there are successful poultrymen throughout the State who are keeping fowls on various other kinds of soils.

Start.

However small the start in poultry-keeping, a ground plan should be prepared before any buildings or fences are erected. This plan should provide room for the extension of every class of building it is intended to erect, and the possibilities in this direction should be well thought out. In the arrangement of the buildings, due consideration should be given to the convenience of feeding and watering. Where a large number are to be kept this is most essential.

Buildings.

All buildings for adult stock should face the east, whether it is intended to keep them on the intensive, semi-intensive, or open system.

By the intensive system is meant keeping the birds all the time in sheds and supplying them with everything they need—food, water, green stuff, shell grit, charcoal and material for the dust bath.

On the semi-intensive system they are kept in sheds as above, but allowed an outside run in fine weather.

On the open system the birds are always at liberty, and use a house only for roosting in at night.

In Victoria the open-fronted house is best; and as the north, west, and south sides are closed in, the birds are protected from the strong wind and heavy rain that sometimes come from those directions. Very little wind or rain comes from the east.

By having the east side open, or nearly so, the early morning sunlight will shine right into the house; this will keep the air sweet and pure and help to keep in check vermin, which become numerous and almost impossible to exterminate in dark, ill-ventilated buildings.

The three sides of the house should be wind-proof, as draughts have a bad effect on birds. It is very important that the roof should be rain-proof; damp floors cause foul odors to rise, and are often the cause of unhealthiness amongst birds.

Great attention should be paid to the floor, which should be from four to six inches higher than the ground surrounding the house. This will ensure a dry floor at all times, as the water off the roof will not soak in on the floor.

Concrete laid to a depth of one and a half or two inches forms the best floor, and should be covered with either cocky chaff or straw as scratching material. Where it is not possible to put in concrete, a good floor can be made from some soils, well wetted and rammed smooth. Both in the Goulburn Valley and at Werribee good floors can be made by puddling the soil with a spade to a depth of from four to five inches, working in sufficient water with the soil to make it about the consistency of porridge. It should then be allowed to set for three or four days, and then gone over with a rammer. A piece of redgum 6 in. x 6 in x 12 in. with a piece of ¾-in. water pipe in the centre for a handle makes a good tool for the job. Should the floor show any cracks, a little sand or powdered earth swept in and again rammed will make a good finish. Where the soil is suitable a splendid floor can be made in this way, and it will set so hard the birds cannot scratch holes in it, and it is easily kept clean.

MATERIAL REQUIRED FOR BUILDINGS.

In choosing material for the house one must be largely guided by what is available in his district.

Excellent houses may be built of flattened-out kerosene tins, but it is necessary to paint these or their life will be short.

Palings put on the lap and space principle are often used, though there is a great risk of vermin breeding in the cracks. They can, however, be kept down by frequent sprayings with kerosene or carbolic emulsions, which can be very easily and cheaply made. An effective emulsion can be made from the following materials:—

1 lb. common soap
2 gals, kerosene
1 gal. boiling water.

This emulsion may be used in the proportion of one part to ten parts of water.

A very good temporary house can be made by building a frame and covering it with tarred bags, but corrugated iron should always be used for the roof.

In some of the Northern districts mud bricks are used. Where the soil is suitable they can be very cheaply made and will last a lifetime, but I consider galvanized iron the best of all,—plain iron for the ends and back (26 gauge will do), corrugated for the roof, and if the framework is on the outside very little harbor is left for vermin. The iron should have two coats of Arabic or some other heat resisting paint. This is not expensive, and if put on well it will last three or four years, and will probably save the lives of some of the best layers, as it has been our experience that it is the heavy layer that goes down first with heat apoplexy.

VENTILATION.

It is most important to provide ventilation at the back of the house, and we find the best way to do it is to allow a six-inch space between the roof and the top of the back wall; a weatherboard can be hinged to the roof plate, and in hot weather it may be opened up, thereby allowing a current of air right through the building under the roof. This will lower the temperature of the house considerably.

HEIGHT.

The poultry house should be of a height to allow head room when working in it. We find six feet in front sloping to five feet at the back sufficient for narrow houses used for breeding pens, single-testing pens, or those for small lots of twelve to twenty birds, but where it is desired to keep larger flocks on the intensive system, it is advisable to have the houses from one to two feet higher.

PERCHES.

The perches should be not less than two inches wide, and when required for a long house 3-inch x 2-inch hardwood with the corners planed off is most suitable. For smaller houses 2-inch x 1-inch timber will do. It is best to suspend them from the roof by wire—if this is done the house is much easier to clean, as there is no obstruction for broom or scraper; it is also much better for the birds. The perches should have a coat or two of hot tar before being placed in position—this will fill up any cracks in the timber, for it is in these cracks and crevices that mites make their home and breed, and emerge at night to prey upon the fowls, only leaving them when they are gorged with blood; it is owing to the colour they assume when filled with blood that they are commonly called Red Mites. These are one of the worst pests in a poultry house, and it requires constant attention to keep them in check.

Perches should not be less than two feet from the ground, so that the birds can pass freely underneath, and also leave plenty of room for the use of a broom when cleaning out. If dropping boards are used the perches can be hung three feet from the ground, and the dropping boards should be 14 inches below the perches.

The perches should be all on one level—not one above the other, as used to be the custom. If the perches are of varying heights the birds will fight for the topmost position, with the result that some may be injured.

The higher the perch the greater the danger of birds bruising the ball of the foot, resulting in what is commonly known as Bumble-foot. This is not only painful to the birds, but often renders the male bird useless for breeding purposes.

About seven inches should be provided for each bird on the perch, and where more than one row of perches are used they should be 15 inches apart.

NEST BOXES.

When possible, nest boxes should be placed 2 feet or 2 ft. 6 in. from the ground, as it saves time and makes it much easier for the attendant when gathering the eggs. Kerosene or petrol tins make the best nests, and are easily kept free from vermin. One nest tin to every four birds is sufficient.

LITTER.

It is advisable to keep from four to six inches of scratching material on the floor of the house, either cocky chaff or straw. The front of the house should be boarded up 15 or 18 inches to keep the scratching material inside the house and prevent waste. If this is done a supply will last three or four months. In wet weather the grain can be fed to the birds in this litter instead of on the ground.

If dropping boards are used they prolong the life of the litter, as most of the manure is voided at night and falls on the boards instead of into the straw. It is a simple matter to rake off the manure and scatter a few handfuls of sand on the boards. This prevents the manure adhering to them.

Size of Houses.

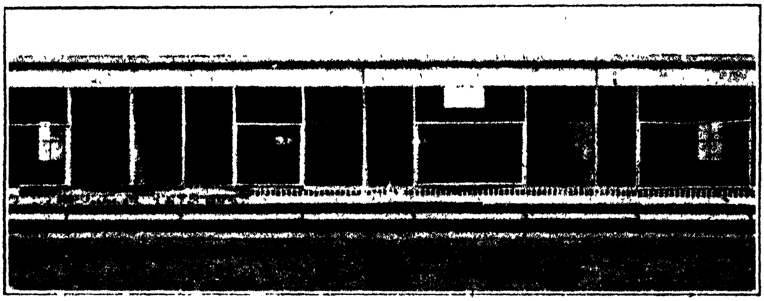
A house 6 feet x 8 feet will accommodate from twenty to twenty-five birds if they have an outside run, but if it is desired to keep them confined on the intensive system, 4 square feet of floor space should be allowed to each bird.

It is generally believed by poultrymen that hens run in small flocks give the best results, but these small flocks entail a vast amount of labour in attendance and a much larger expenditure in construction and maintenance than is the case with flocks of from one to five hundred.

By building a better class of house with provision for scratching material almost equal results can be obtained, and there is no question of its superiority.

Laying Shed.

One of the best houses for the purpose of keeping a large flock of layers is that in use on the Werribee Research Farm. This house is 120 feet long by 20 feet wide, 9 feet high in front and 7 feet at the back, which gives a capacity for 570 birds. It is constructed of iron, and faces the east. It is divided into two parts by a wire-netting passage 6 feet wide, which gives access to the yard in front of the building. In this passage are two doors, one leading into each half of the house. This passage also serves the purpose of a catching pen; when birds are to be caught for culling or removal they can be driven into it and there caught much more quickly than in the house.



Laying Shed.

The back or western wall of the house has eight windows and four louvre ventilators placed at regular intervals. The front is closed in 2 feet up at the bottom and 1 foot down from the top; the remainder is covered with wire netting.

A piece of 4-inch galvanized-iron spouting is fixed along the front 1 foot from the ground, and serves the purpose of a drinking trough. Holes 4 inches by 2 inches are cut in the iron at intervals to enable the birds to put their heads through and drink; a board cover is hinged above the trough to protect the water from the sun's rays. The water is laid on and a plug provided at the opposite end to the tap for the convenience of cleaning. Above this trough is another at a height of 2 ft. 6 in. from the ground extending the full length of the house; this serves the purpose of a feed trough.

A 2-inch x 1-inch batten is fixed inside at a convenient height for the birds to fly on to a stand while feeding; pieces of hoop-iron are spaced 2 inches apart to enable the birds to put their heads through to feed.

With these conveniences, the feeding and watering of between five and six hundred birds can be accomplished in a few moments.

The nests made from kerosene tins are fixed along the back wall about 2 ft. 6 in. from the ground, and this enables the attendant to gather the eggs quickly and easily.

Four rows of perches are provided, and are made from 3-inch x 2-inch hardwood with the corners planed off; these are suspended from the roof by rods of iron three-eighths of an inch in diameter. The perches are placed 3 feet from the ground and 14 inches apart. The dropping boards are hung 14 inches underneath. The perches are hung 4 ft. 6 in. from the back of the house, which allows an ample passage for the egg collector and for cleaning the dropping boards. Several dust baths 3 feet square and 15 inches deep are provided.

This style of house can be thoroughly recommended, and the size may be adapted to suit requirements.

Breeding Pens.

Breeding Pen.

The breeding pen should have an outside run, as birds kept too closely confined produce a great many infertile eggs.

The breeding pens at the Werribee Farm can be recommended as models. They are 60 feet long and 12 feet wide, with a house at one end. The houses are built to serve two yards, and are 16 feet wide by 6 feet deep, 6 feet high in front and 5 feet at the back, divided in the centre by wire netting. Each yard has a house 8 feet by 6 feet; this allows 1 ft. 4 in. for the nest boxes (which are built to open from outside, so that the attendant may gather the eggs without entering the yard) and 2 ft. 6 in. for a gate to each yard.

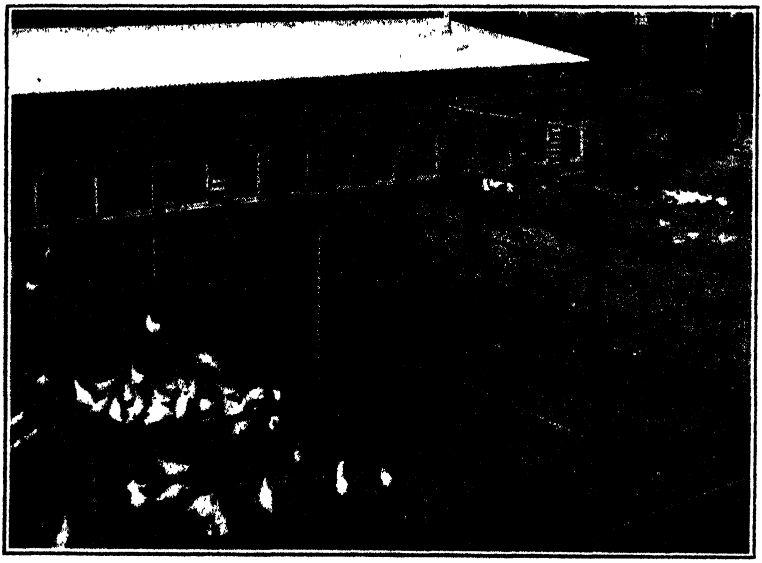
GATES.

All gates should be at least 2 ft. 6 in. wide, so that a wheelbarrow may pass through when necessary.

Half of the front of each house is closed in and boarded up 12 inches so as to confine the scratching material to the house and prevent waste. A dust bath is provided, and there is room for five nest tins in the laying portion. Water is provided in a half-round earthenware pipe running the full length of the yards on the outside; it is set level, 1 foot from the ground, and a tap at one end is provided; holes are cut in the netting at intervals for the birds to put their heads through and drink. A board cover should be placed over the trough to protect the water from the sun.

When building permanent yards of this description, it is very necessary to make provision for keeping the soil in good sanitary condition. This can be done by occasional dressings of lime, and by breaking up the surface of the ground to a depth of 2 or 3 inches. To do this with the least labour, a horse and small cultivator should be used.

When erecting the fences in rows of yards similar to those at Werribee, portion of the fence at both ends of each yard should be made of 3 inch by 1 inch battens, 7 feet wide and 6 feet high. These can be held in position by wire pins, and may be easily removed to permit a horse and cultivator to pass through. With all the hurdles removed, there is a clear passage from one end of the pens to the other, and the cultivator can be driven up one pen and down the next, and finally the passages cultivated the same as headlands in a field. The twenty-four yards at Werribee can be done in under three hours, whereas the digging of them would probably take three days.



Brooder House.

Brooder House.

Where it is intended to rear a large number of chickens, a brooder house is necessary, and any building required for this purpose should, in victoria, face the north. The reason for this is that the best time to carry out breeding operations is during the months of July, August, and September. At this time of the year, not only the nights, but many of the days, are very cold, and it is desirable to get as much sunlight into the house as possible. With the building facing the north and the windows built-in low down, it is possible to get the sun on the floor during the greater part of the day in fine weather, whereas, if the building faced east, the interior would not get any sun after about eleven o'clock in the day.

One of the best brooder houses I have seen is that in use at Werribee. This house is 60 feet long, 15 feet wide, 7 feet high in front and 8 ft. 6 in. at the back. It has twenty windows let in the front wall 1 foot from the ground, and five windows in the back wall close to the roof; these windows are 3 feet by 2 feet. As the pitch of the roof is from the back to the front, the fresh air comes in at the windows in the front, but above the chickens, and the bad air is drawn off by the windows at the back near the roof.

This house is partitioned off into five rooms and will accommodate 2,000 chickens. In front there is a yard 35 feet long, which can be subdivided by temporary hurdles and the chickens given a run on the grass when the weather is fine.

It is very necessary to keep the soil in this yard in good sanitary condition. After each breeding season it is sprinkled with lime, ploughed in, and allowed to sweeten by exposure to the sun and air till midwinter, when it is sewn with rye grass, the growth of this not only helps to purify the soil, but provides a nice green pick for the chickens in the spring.

WEEDS AND THEIR ERADICATION.

(Continued from page 31.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Wild Sage, *Salvia Verbenaca*, L Family: *Labiatæ*.

Although wild sage, which is a native of Europe, has been found a pest in parts of Victoria the family to which it belongs, *Labiatæ*, contains some of our most useful plants; many of them are fragrant and aromatic, such as lavender, peppermint, thyme, marjoram, and sage. Some species of sage (Salvia) are also cultivated for the beauty of their flowers, the well-known Bonfire Salvia being a familiar and much admired example.

Wild sage has oblong blunt leaves, wavy at the edge and crenate Like the garden sage, it is an aromatic herbaceous plant, usually growing from 1 to 2 feet in height, and in the flowering season it is made conspicuous by its long spikes of small purple-blue blossoms. The leaves are few in number, and are widely spaced on the stems of the plant (Fig. 53).

Wild sage is a useless species, and is already a proclaimed plant in the Wimmera and Warrnambool shires. It has a wide distribution in Victoria, and is now to be found growing over a wide range of soil, varying in quality from that of good to that of very poor.

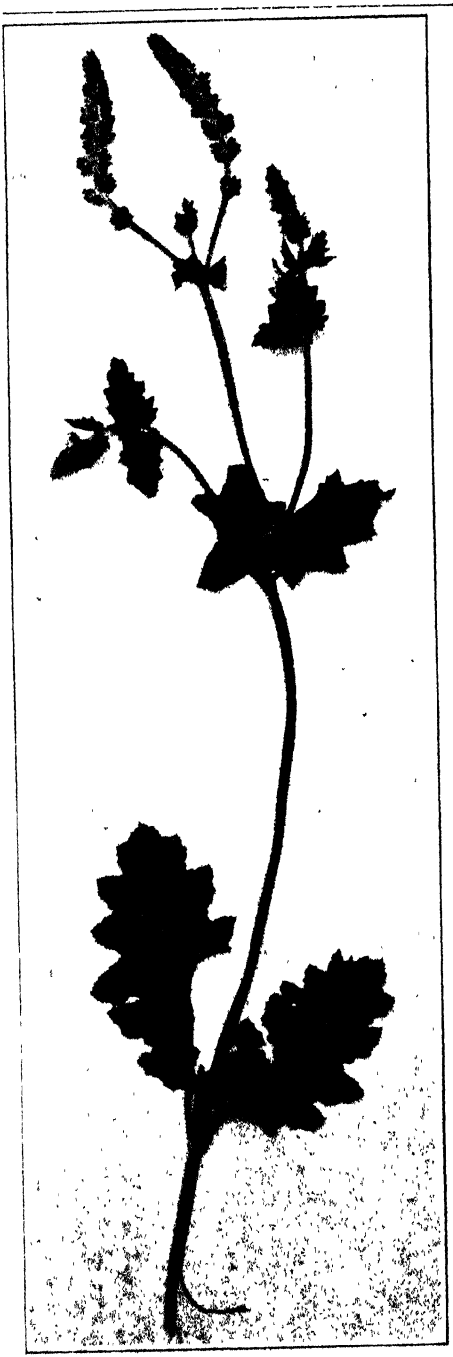


Fig. 53.—Wild Sage, *Salvia verbenaca*. (Oct., 1922.)

The plant should be hand-pulled and burnt before it ripens its numerous seeds. It can easily be suppressed by cultivation in spite of its perennial nature.

Wood Sorrel or Soursob,
Oxalis cernua, Thunb.
Family: *Oxalidaceæ.*

The wood-sorrels were probably introduced into Victoria for ornamental purposes, but these plants, like many other unconsidered introductions, have, owing to our favorable climate, got out of hand and have now become pest weeds.

Oxalis cernua (Fig. 54), which is native to South Africa, is a bulbous plant having conspicuous yellow flowers. It will grow in almost any part of the State, but thrives best in shady situations and acid soils.

Besides bearing numerous seeds, the wood-sorrels are able to increase rapidly by means of their bulblets. Owing to the plant's perennial nature, it is sometimes hard to get rid of, and often becomes a great nuisance in gardens, and if left undisturbed will take entire possession of them.

Digging out the plants and burning them, followed by cultivations, will complete the eradication of this undesirable. As it favours acid soils, a lime application at the rate of from 7 to 10 cwt. per acre, which would tend to correct the soil acidity, would make conditions less congenial for it. If the acidity is due to lack of drainage, this defect should be corrected, otherwise lime applications would be of little use.

Creeping Buttercup, *Ranunculus repens,* L. Family: *Ranunculaceæ.*

This useless perennial weed is one difficult to get rid of on account of its extensive stolons forming roots at the nodes, from which fresh plants make their appearance (Fig. 55).

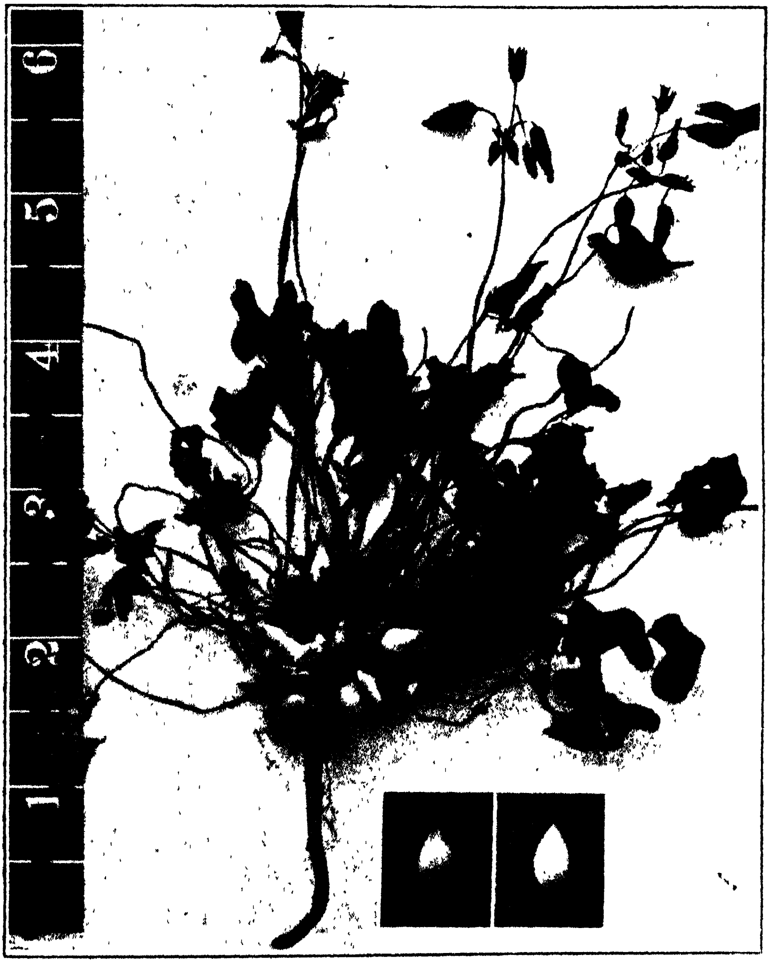


Fig. 54.—Soursob, *Oxalis cernua* Thunb. **Inset - Bulblets removed from plant.**
(Specimen obtained October, 1922.)

Creeping Buttercup delights in rich moist soils, and in such situations can easily become most troublesome, especially so on river frontages, where it may occupy a very considerable amount of room and crowd out grasses in a very short space of time (Fig. 56).

Its leaves are three-parted, with hairs on veins and petioles; the terminal segment of leaf is provided with a short footstalk, and the whole leaf is of an irregular-toothed outline. It grows from 12 inches to about 20 inches high. Its bright yellow flowers, each of which is capable of producing numerous seeds, are of the usual buttercup type, and are nearly an inch wide. The stalks are channeled.

The flowering period is during the spring months, and in Victoria this is usually finished by the end of October, after which time the plant concentrates its energies in throwing out numerous underground runners.

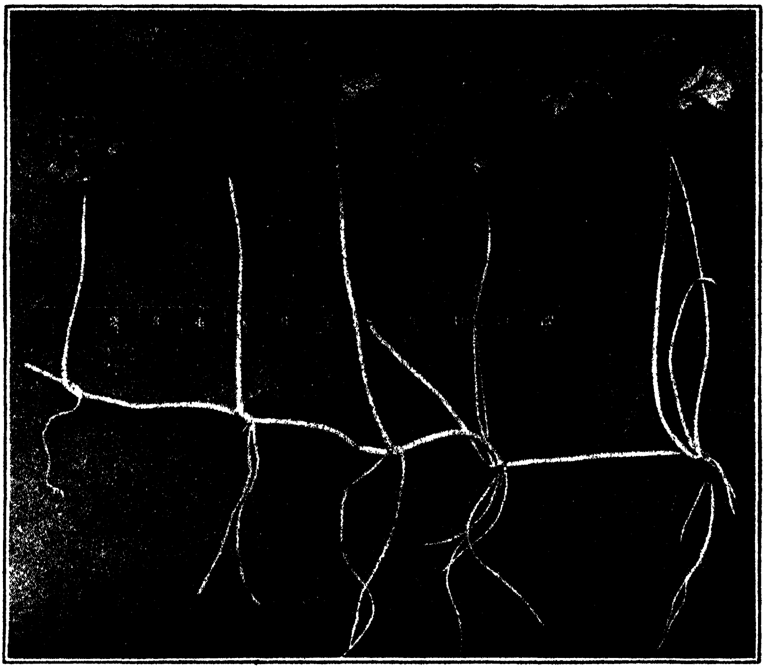


Fig. 55.—Creeping Buttercup, ***Ranunculus repens*** **L. Showing young plants arising from underground runners.**

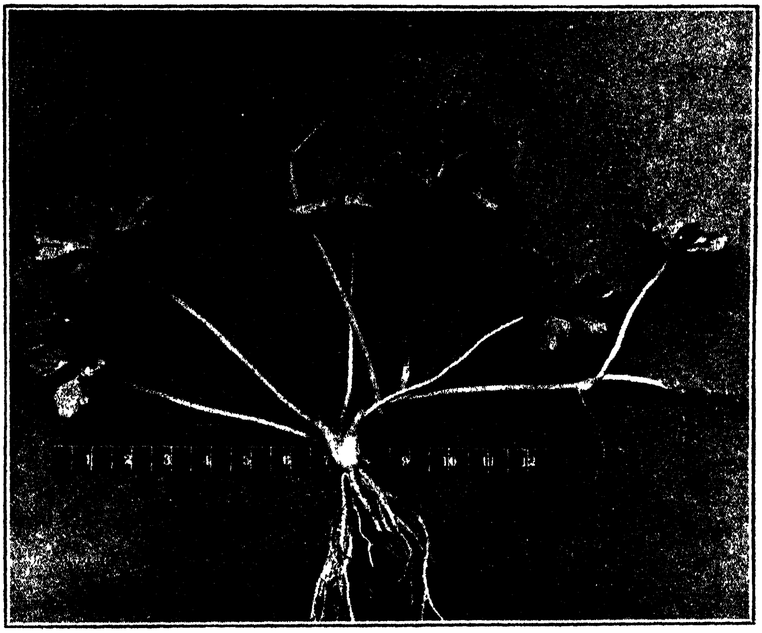
As soon as any plants of this species are discovered they should be destroyed by being carefully dug out and burnt before the seed has ripened.

Creeping Buttercup, by means of its numerous seeds and runners, can easily become a serious pest. Although it favours moist situations, it is able to live through long dry periods during the summer months, becoming again actively aggressive when the winter rains set in.

The genus *Ranunculus* is an extensive one, containing a great many species, many of which are acrid, caustic, or even poisonous.

R. repens, a native of England, although ornamental, is a useless species. Good cultivation will be found to be effective against this plant when it occurs over large areas, but if growing in small patches it should be dug out and burnt.

Owing to the number of species of pest plants that have been allowed to thoroughly establish themselves in this country, farming might now be called a warfare against weeds, for unless they are kept under control, they are capable of seriously limiting the growth of crops or grasses, as well as increasing the cost of the labour involved in the growing of clean crops.



Plant of Creeping Buttercup, ***Ranunculus repens*** **L.**
(Specimen obtained October, 1922.)

(To be continued.)

LEGUMES AND THEIR NITROGEN CONTENT.

THERE is, unfortunately, an impression among farmers that if the leguminous crop is removed from the land and the roots with their nodules remain, the soil is thereby enriched in nitrogen. It must be clearly understood, however, that the nitrogen taken from the air by the organisms does not exist in the nodules, but is made use of and distributed throughout the plant, and that the removal of the above-ground portion of the plant from the land means the removal of a large amount of nitrogen. An increase in the nitrogen content of the soil can only result from the growing of leguminous crops when they are either fed off, ploughed in, or soiled to stock and the resultant manure from the stock returned to the soil.—*Agricultural Gazette of New South Wales,* December, 1922.

POTATO EXPERIMENTS, WERRIBEE.

August to December, 1922.

By J. T. Ramsay, Potato Expert.

Last season various potato experiments were carried out on the farm of Mr. G. Barker, of Werribee, and the results are given hereunder.

The trials were conducted under irrigation and included—

I. Variations in manuring.
II. Immature *v.* ripe seed.
III. Variety tests.
IV. Selected seed *v.* unselected.
V. Seed from various districts.
VI. Pairing the rows for irrigation *v.* planting at equal widths.

Planting took place on 7th August, 1922, and a start with harvesting was made in the third week of December.

The season was not favorable for growth owing to the prevalence of strong cold winds. Practically no rain of any consequence to the crop fell during the growing period, so that the results obtained are almost entirely the production from water artificially applied.

The following tables indicate the variations in seed, manures, or treatment together with weights per acre yielded:—

Manure Trial.

Plot.	Fertilizer per acre.	Yield.	Increase.
		tons cwt.	tons cwt.
1	No manure	3 7	..
2	5 cwt. superphosphate .. .	4 0	0 13 or 19 %
3	10 cwt. superphosphate . ..	6 9	3 2 or 92 %
4	5 cwt. super. and 1 cwt. ammon. sulp. ..	5 4	1 17 or 55 %
5	10 cwt. super. and 2 cwt. ammon. sulp. ..	6 9	3 2 or 92 %
6	10 cwt. basic super.	6 0	2 13 or 79 %
7	5 market garden	4 6	0 19 or 28 %

While there is nothing sensational in any of these weights per acre, an important point is the fact that there is a constant increase in every case where manure was applied, and the substantial nature of these increases is shown in relief when expressed in percentages.

Another form of showing the benefits accruing from the use of artificial fertilizers is illustrated in the following table giving the values per acre of the crop from the various manures. The rates are calculated on a value of £8 per ton, which is a fair average of the prices ruling at the time the crop was harvested. The cost of manures is also tabulated, together with the cash increase after deducting manure costs:—

Plot.	Value of Crop per acre.	Cost of Manure per acre.	Net Cash Increase per acre.
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
1	26 16 0	Nil	Nil
2	32 0 0	1 7 6	3 17 6
3	51 12 0	2 15 0	22 1 0
4	41 12 0	2 5 6	12 10 6
5	51 12 0	4 11 0	20 5 0
6	48 0 0	2 12 6	18 11 6
7	34 8 0	2 0 0	5 12 0

There has to be taken into consideration, of course, the fact that in the case of the heavier yields the cost of digging, bagging, &c., would be greater than in the lighter yields, but these extra charges can easily be borne and still leave substantial percentage profits.

Consideration must also be given to the fact that the gain from manures is not exhausted by the crop to which it is applied.

Last year's manure trials at Werribee gave substantially the same results as this season. The land occupied by the potatoes in the season 1921-22 was sown in October with lucerne without further manures being applied. A good strike all over was secured, but the growths on the various sections occupied by the manure plots on the preceding crop of potatoes were noticeably different—vastly superior stands of lucerne being obtained on the sections treated with manure.

Water Supply Channel, Werribee.

It would be most interesting to follow this out by weighing the season's lucerne production on each and noting the differences in yields.

In the test of immature *v.* ripe seed, the source of supply of the two classes of seed was the same, the result given below being produced. In view of the fact that the superiority of immature seed has been demonstrated times out of number, it is remarkable that the practice of using it has not yet, here, come into general vogue.

IMMATURE v. RIPE SEED.

	Tons cwt.	Value at £8 per ton.
Immature Seed	4 9	£35 12 0
Ripe Seed	2 14	£21 12 0
Increase per acre in Immature ..	1 15 or 64 %	£14 0 0 per acre.

This result requires no further comment.

Several varieties were tested under similar conditions. The tonnage of each are given herewith:—

	Tons	Cwt	0	0 per acre
Carman III.	7	11	0	0
Carman I.	6	16	0	0
Red Ohio	5	3	0	0
Delaware .. .	7	1	0	0
American Wonder ..	4	5	0	0

General View of Potatoes Growing under Irrigation.

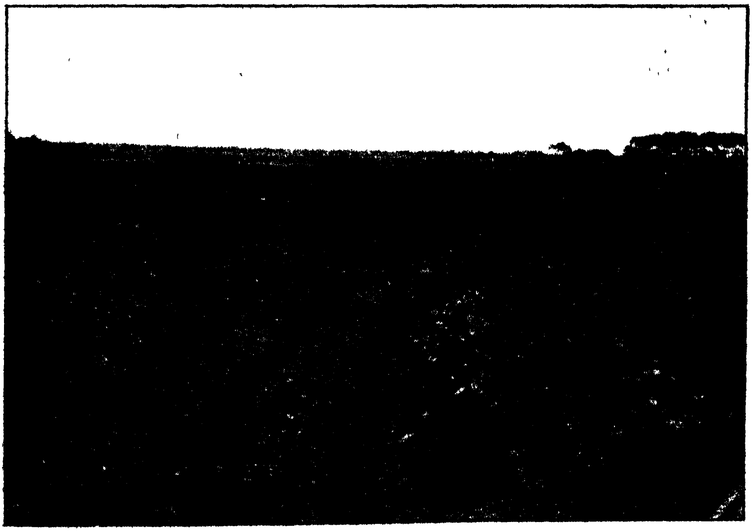
The importance of selecting seed from heavy bearing plants is illustrated in the following table:—

SEED SELECTED AND UNSELECTED.

Class of Seed.	Yield per acre.	Comparative Ratios.
	tons cwt	
From plants producing seven and over ..	4 9	100
From run of plants	3 13	80
From plants producing three and under . ..	2 1	46
From seed with weak shoots	1 2	24

A test was made of seed from various districts with the object of getting some light thrown on the question of change of seed. It is the contention of many that seed from districts of high altitude is

Irrigating Potatoes.



Types of Top Growths.

Plants from unselected seed on the left and from selected seed on the right.

superior to that from districts near the sea level. The accompanying result is given. The variety used in every case was Carman I.:—

District.	Yield.
	tons cwt.
Romsey (high level)	7 11
Catani (Koo-wee-rup Swamp)	6 16
Trafalgar Swamp	5 15
Woodend (high level)	4 17

This result is not submitted as being conclusive. My strong opinion is that it is of greater importance to pay attention to the strength of the stock from which seed is secured than to the district from which it is obtained.

It was suggested by some growers that the ordinary method of planting the sets in rows from 28 to 30 inches apart could be improved on by "pairing" the rows, *i.e.*, planting two rows close together, then leaving a wide space between these and the next pair for irrigating and cultivating. These two variations in planting were tried with the following result:—

Method of Planting.	Yield.			Marketable.
	Large.	Small.	Gross.	
	t. c. q. lbs.	t. c. q. lbs.	t. c. q. lbs.	per cent.
Rows paired	3 18 3 0	1 2 2 0	5 1 1 0	78
Rows equidistant	4 16 3 20	0 10 0 14	5 7 0 6	90

The same number of rows per chain width were worked into this plot. It will be noted that while there was but little difference in the gross yields from these spacings, there was a marked increase in the percentage of marketable tubers in favour of the rows planted equidistant at approximately 30 inches, amounting to 18 cwt. per acre.

With regard to the smaller tonnages per acre obtained in the sections devoted to testing the values of selection and immature seed, it is pointed out that these sections were sown with seed saved from the Werribee plot last year. Being harvested in early January, 1922, this seed was much further advanced at the date of planting than the seed from other later districts. The Werribee-saved seed made growth, consequently, much more rapidly than any other, and that very fact was the crop's downfall, as it suffered tremendously from the heavy wind storm of the 14th October, from which it never really recovered. Seed from other districts growing alongside escaped this gale by having considerably smaller haulms at that date.

An outstanding lesson to be gained from the two years' potato trials at Werribee under irrigation conditions is the paramount importance of being able to *follow irrigations of the crop very closely and thoroughly with cultivation.* That means that a grower should only plant under potatoes in an irrigation district such an area as he will be able to attend to without straining his farm working strength.

FRUIT INDUSTRY OF VICTORIA.

Its Present Status and Future Outlook from a Commercial Stand-point.

(Continued from page 3.)

PART II.

By E. Meeking, Senior Fruit Inspector.

Before reviewing the industry from the various stand-points mentioned, in the order indicated, a better appreciation will be gained by a statement of the development of the industry generally for the nine years 1912-13 to 1920-21. This includes the war period, and two years prior to the commencement of hostilities and two years after the signing of the armistice. To give a proper estimate of the relative increase or decrease in the acreage and quantities produced for the various kinds of fruit, and also the relative proportions of these in relation to the Commonwealth total, the figures quoted hereunder have been compiled on the basis of the average acreage and quantities produced for each season during the whole of the nine-year period:—

Fruit.	Average Acreage for Victoria.	Percentage of State Acreage to Commonwealth Total.	Percentage of each kind of Fruit to State Acreage (all Fruits).	Percentage. Increase or Decrease.	Average Quantities produced in Victoria.	Percentage of Commonwealth Total of Fruit produced in Victoria.	Percentage of each kind of Fruit to State's Total production (all Fruits).	Percentage. Increase or Decrease.
					bushels.			
Apples ..	19,881	31·27	27·67	6·5	1,569,095	32·09	27·78	— 5·3
Apricots ..	4,110	46·93	5·72	3·	216,521	38·96	3·83	— 42·3
Cherries ..	3,282	57·78	4·56	14·2	93,400	45·92	1·65	— 61·9
Figs ..	427	39·24	·59	13·5	22,318	25·26	·39	— 6·4
Grapes (table)	2,236	29·59	3·11	—11·2	148,425	27·43	2·63	— 7·5
Grapes (drying)	13,254	57·89	18·44	54·7	1,939,933	65·13	34·35	11·6
Lemons ..	834	19·14	1·16	39·7	66,904	17·84	1·18	16·
Nectarines ..	170	35·49	·23	82·8	10,878	43·99	·19	47·
Oranges ..	3,653	15·35	5·08	79·3	88,511	4·84	1·56	39·2
Peaches ..	7,048	37·9	9·81	22·	523,273	39·37	9·26	44·7
Pears ..	8,250	60·41	11·48	24·1	607,262	54·24	10·75	27·4
Plums ..	3,445	42·53	4·79	4·7	252,423	42·51	4·47	— 15·8
Passion Fruit	210	85·71	·29	50·	10,549	16·28	·18	60·2
Quinces ..	992	57·4	1·38	20·2	74,350	46·81	1·3	9·6
Raspberries	..	..	..	..	12,761	13·14	·22	—100·9
Strawberries	4,050	38·38	5·63	6·1	10,560	41·83	·18	— 15·3
All Other	..	..	..	..	..	..	..	..
Totals ..	71,842	35·	..	18·7	5,647,163	32·39	..	4·8

NOTE.—Minus sign thus — indicates decrease.

This table has been compiled by adding the figures for the whole nine seasons, dividing these by nine, and taking the percentage increase or decrease of these figures as against the figures for the first season of the period.

The outstanding feature of these figures is the fact that, whilst the average increase of the Victorian acreage has been 18.7 per cent., the average increase in quantities produced in the State amounts to only 4.8 per cent. This indicates that the major portion of the increased area consists of newly planted orchards, which have not yet come into bearing. A study of the different varieties of fruit shows that this discrepancy between the increase or decrease in area and the increase or decrease in quantities is most marked in the following:—

Fruit.	Average Acreage, per cent. Increase.	Average Quantities. per cent. Increase.
Apples	6.5	—5.3
Apricots	3.0	—42.3
Cherries	14.2	—61.9
Lemons	39.7	16.0
Oranges	79.3	39.2

All these show that the areas planted have increased in greater ratio that the quantities produced. In the case of peaches, however, it will be noticed that, whilst the area has increased only 24.1 per cent., the quantities produced have increased 44.7 per cent., indicating that, although the area under peaches has increased, the increase has taken place in the first years of the period named, and that during the last-few years peach-planting is not so popular as formerly. As will be shown later, it is, perhaps, as well that this should be so.

Taking the table generally, it would appear that within the next few years, the greatest increase will be in citrus fruits, and grapes for drying purposes. This will entail corresponding expansion in the marketing and distributing side, so that the increased production may be successfully met.

Dealing firstly with the local trade, it may be stated, generally, that its future development depends upon (*a*) production, distribution, and marketing costs; (*b*) facilities for readily and expeditiously reaching the consumer; and (c) the wholesale and retail prices.

Taking these factors seriatim: Details will be given in the next number of the *Journal* of (*a*) pre-war and present costs of establishing and maintaining a 20-acre orchard; (*b*) rail freights; (*c*) local distribution costs in the metropolitan markets. In addition to the foregoing, an outline of the facilities which exist in the metropolitan market for sale and distribution of fruit, as against the present facilities in this regard, will be given.

(*To be continued.*)

SCIENTIFIC WHEAT-GROWING.

RESULTS OF OFFICIAL TESTS.

Variety Tests in the Mallee.

Victorian farmers are keenly alive to growing only those wheat varieties which yield heaviest. The superiority of the Farrer crossbred, Federation, and the rapidity with which it swept all before it when introduced sixteen or seventeen years ago, will not readily be forgotten. The displacement of the old varieties by the brown-headed Federation was so complete that in a short space of time the characteristic golden-yellow colour of the harvest fields in the north was changed to bronze. Incidentally, an extra £250,000 was annually placed in the pockets of the farmers.

Since that time numerous attempts have been made to better Federation, but it constituted so great an advance that the task has not been easy. However, Mr. Pye has succeeded in evolving a variety, "Major," which has in its turn outed Federation from the east part of the Goulburn Valley, and the Department of Agriculture has evolved wheats which are attacking the Federation stronghold of the Wimmera and Mallee. Gallipoli is a new crossbred wheat bred at the Research Farm, Werribee, which has given a good account of itself in the Wimmera. It is prolific, short-strawed, and very hardy, but is rather tough in threshing.

Careful tests of new varieties have been made in the new Mallee districts. One experimental field is conducted by the Agricultural Department on the farm of Mr. P. G. Stewart, M.H.R., at Carwarp, in the Mallee, near Mildura. For the period 1918-1921, Gallipoli headed the list with an average of 15.9 bushels per acre. Penny was next with 15.8, then follow Canberra (15.4) and Mac's White (15.3). The average yield of Federation over the same period was only 13.7 bushels per acre. During 1921 and 1922, additional new crossbreds have been tested alongside the standard varieties. So far they have proved superior. It will, however, require two or three years' further test to make certain of the results.

DETAILS OF YIELDS OF WHEAT AT CARWARP, 1921-1922.

Wheat sown at the rate of 45 lbs. per acre, with 50 lbs. of superphosphate, on new land not fallowed. Plots each one acre in area.

	Yield. Bushels per acre		
	1921.	1922.	Average for 2 years.
New crossbred—Indian E. x Telfords	13.0	12.2	12.6
„ „ Indian F. x Federation	12.0	13.0	12.5
Canberra	11.9	10.7	11.3
Mac's White	10.1	12.5	11.3
Gallipoli	9.5	11.2	10.4
Wannon	7.9	11.8	9.9
Currawa	7.8	10.7	9.3
Federation	8.6	9.9	9.3
Penny	6.9	10.0	8.5

The low yields are due to the fact that the wheat had to be sown on non-fallowed land, also that the seasons were very dry.

It will be noted that the new wheats are superior to standard varieties like Federation, Currawa, and Penny.

Trials of New Wheats at Willaura.

Tests for the purpose of determining the variety of wheat that would give the best results under Willaura conditions, and also the kind and quantity per acre of fertilizer most profitable to use there, were carried out by the Department of Agriculture last season on the farm of Mr. F. Lindon, at Willaura.

A new crossbred wheat, as yet unnamed, but designated No. 78A, was tested there for the first time. Previously it had done well elsewhere in the Western District. It has given the highest yield at Willaura.

DETAILS OF RESULTS.

Plots, each ½ acre; sown 1st June, with wheat at the rate of 75 lbs. per acre, and with 1 cwt. of superphosphate, on fallowed land.

	Bushels per acre.
New Crossbred—No. 78A	26.1
Yandilla King	25.8
Cleveland	25.1
Federation	24.7
Turvey	24.4
Gallipoli	22.1
New Crossbred—No. 12	21.7

No. 78A is a cross between Stanley and Bob's wheat. It was originated at the Research Farm, Werribee. Further trial will be necessary at Willaura to ascertain its behaviour in comparison with standard varieties over a peiod of several years. Cleveland wheat was imported from New South Wales for trial. It does well there in the coastal districts.

Fertilizer Tests at Willaura.

Tests with manure were made with Major wheat sown on fallowed land in half-acre plots. The rate of seeding was 75 lbs. per acre, and the time of sowing similar to the variety tests.

DETAILS OF RESULTS.

Wheat Manurial Tests—Willaura.

	Bushels per acre.		
	1921.	1922.	Average for 2 years.
Super., 2 cwt.	33.9	22.4	27.7
Super., 1 cwt.	28.7	19.8	24.2
Basic phosphate, 1 cwt.	23.8	21.6	22.7
Bone fertilizer, 1 cwt.	18.6	21.6	24.2
Lime, 10 cwt.	13.6	16.3	14.9
No manure	12.4	12.0	12.2
Super, 2 cwt.	33.9	22.4	27.7
Lime, 10 cwt.; and super., 1 cwt.	31.9	22.0	26.9
Local gypsum, 3 tons; and super., 1 cwt.	31.4	21.4	26.4
Lime, 10 cwt.; and super., 2 cwt.	29.4	23.4	26.4

The table demonstrates the superiority of superphosphate over the other manures tried, and indicates that heavier dressings of it than are commonly used in the district give the best yields. Lime appears to have an influence on the yield when used with 1 cwt. of superphosphate, but not commensurate with the cost of the application. Local gypsum on this soil apparently has much the same influence as the lime. The cost of the local gypsum would be less than the lime. The soil is a sandy loam.

The relative amount of profit gained by the use of the various fertilizers, after paying the cost of the manure out of the increased crop, is set out below:—

Bushels per acre.

Treatment.	Yield 1922.	Increase due to manure.	Value of increase at 4s. bushel.	Cost of the manure.	Extra profit due to the use of the manure.
			s. d.	*s. d.*	*s. d.*
No manure ..	12.2	..	..	..	..
Super. 2 cwt. ..	27.7	15.5	62 0	11 6	50 6
Super. 1 cwt. ..	24.2	12.0	48 0	5 9	42 3
Basic phosphate, 1 cwt.	22.7	10.5	42 0	5 9	36 3
Bone fertilizer, 1 cwt.	16.4	4.2	16 9	8 6	8 3

In calculating the above table, very liberal allowance has been made for freight on the manure, and wheat has been assessed at a conservative price.

The table illustrates the splendid monetary return that superphosphate gives the wheat farmer in this district who uses it judiciously. Applications at the rate of 1 cwt. per acre have increased the yield by 12 bushels per acre, and resulted in an average increased profit of 42s. 9d. per acre as compared with wheat raised without manure. Where 2 cwt. of superphosphate was used the yield was increased by no less than 15.5 bushels per acre, and the profit has been enhanced by a further 8s. 3d. per acre, totalling 50s. 6d in all. Other fertilizers, such as bone fertilizer, &c., gave a lesser profit.

The results show the remarkable potency of water soluble phosphatic manures, such as superphosphates, on these soils.

The power of the fertilizer is better understood when it is realized that the dressing at the rate of 2 cwt. of superphosphate per acre produced an increased crop which weighed more than four times as much, viz., 8½ cwt., as the fertilizer applied.

SUCCESSFUL SHEEP FARMING.

The following notes on the method of handling ewes and lambs at the Rutherglen State Farm are taken from a report by the manager of the Farm, Mr. P. B. O'Keefe:—

A flock of 400 cross-bred and 60 Border Leicester ewes was lambed down. In addition, we had 100 other adult sheep; thus 560 sheep, with 470 lambs, were carried on the farm. The actual area reserved exclusively for their grazing was 243 acres; but they also had the run of last season's stubble before it was fallowed, and of a further 200 acres fallowed during September and October.

When it is considered that the most successful graziers in the district estimate that the area of land required to carry a ewe and fatten her lamb is at the very least an acre and a half, we can claim that ours is a record in stock carrying. Some may argue that it is impossible to produce prime lambs under such stocking conditions, but our answer is that our lambing percentage was 102.5, and of the 410 cross-bred lambs, 322 were sold at 22s. per head for freezing. A further 61 sold at Newmarket realized 16s. 3d., leaving a tail of only 27. The proceeds from sale of lambs is therefore just on £400. We still have the price of wool to come, only the bagged wool being sold to date. The price obtained for this was 23d. per lb., which augurs well for a big wool cheque.

A few notes on the way the sheep were handled may be of interest. In July, 1920, the 200 acres of pasture on which the sheep graze was dressed with superphosphate at the rate of 1 cwt. per acre; and a further dressing, at the same rate, was given to 140 acres in May, 1922.

Lambing commenced on 26th June, 1922, the whole flock being grazed on such stubble paddocks as were available. Every couple of days before the ewes left camp in the early morning, the unlambed ewes were worked quietly away from those with lambs, and removed to another paddock. Those with young lambs were gradually bulked into the one flock for convenient handling and put on the best feed available—fresh stubble, young crops, or manured grass. They were always worked quietly from paddock to paddock well before night-fall, so that the lambs might be mothered before dark, and so protected from foxes.

When about 50 lambs were dropped, they were marked. This operation was carried out thus early so as to avoid any check in their growth, which might have occurred if marking had been delayed. As the number of lambs increased and grew, the demand for feed became more insistent, and about the end of July an attempt was made to supplement the pasture with hay chaff, but after wasting about 10 tons, which the sheep refused, the attempt was abandoned.

By the end of September the lambing was finished, and from then on the whole flock was removed regularly from one paddock to another of the five which carried them through. The shortest period for which they were grazed on the small paddocks was two days, and on the larger from five to seven days.

The heavy carrying was made possible by regular attention to the flock, frequent change of feed, good supply of pure water, licks of coarse salt containing 2 per cent. of iron sulphate, and last, but by no means least, the top-dressing of the pastures. It is, perhaps, worthy of mention that the general impression is that the result of a superphosphate top-dressing is more marked under wet than dry conditions; therefore, its good effect was surely its minimum this season, with its deficient rainfall.

Crops.

In his report on the season's harvest, Mr. O'Keefe says:—

District yields generally were far in excess of the farmers' estimates, who were pessimistic owing to the heavy pre-harvest winds and dry scorching conditions during early summer, following on a year of very low rainfall. The total rain for the year was only 14.85 inches—the third lowest record for twenty-three years. The last useful fall was during October, which raised the total for that month to 1.83 inches, an amount quite insufficient to counteract the dry conditions both preceding and following that month.

The highest yield of wheat in the vicinity of the College was an average 25½ bushels per acre from an 80-acre field. The best hay crop was estimated to give 3½ tons to the acre. This was grown on a hillside, with a damp, easterly aspect. At the State Farm the hay crop of 200 acres, mostly following wheat and oats on fallow, yielded a total of 340 tons. Wheat for seed on fallow gave seven and a half bags to the acre, and that on early-ploughed land averaged five and a half bags. The oat crops on fallow yielded seven and a half bags per acre. Grading of seed has commenced, and it is expected that the last of the grain will be ready for distribution by the end of March.

Cultivation.

Two hundred acres were fallowed during September, half of which will be planted with wheat during the 1923 season, and the other half with oats. Sixty acres of that intended for wheat was badly infested with thistles. This was disced before they reached the flowering stage. We should thus be assured of a clean wheat crop. It is intended to break up two paddocks that are plough-sick, and plant them with Wimmera rye-grass and subterranean clover. They will be left two years in pasture, and then fallowed for wheat.

PIGS AND THEIR MANAGEMENT.*

We are in receipt of a copy of the fourth edition of Mr. H. W. Potts' book, "Pigs and Their Management." The fact that a fourth edition has been found necessary is ample proof of the popularity of the book with pig-breeders and feeders in Australia. It contains much valuable advice and information, and is specially written for the guidance of those engaged in the industry in Australia.

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* Published by Angus and Robertson, Sydney. Price 12s. 6d.

In speaking of the breeds suitable for this country, Mr. Potts says:—"We in Australia have not had such lengthened experience with the white pigs as with the Berkshires, but they are asserting a claim to pig-breeders' attention which is certain, in the long run, to challenge the Berkshire's claim to leading place. . . . . The English stud books prove that the large Yorkshire is the most fashionable. Large numbers are sent to the Continent as well as to Canada and North America. The flesh is sought by both butchers and packers, owing to its succulence and lean meaty character. One prominent packing firm in Canada pays 4s. to 5s. per 100 lbs. more for this breed than for any other. A series of tests conducted in the United States places the large Yorkshire breed first, in that it produced 100 lbs. of pork at a smaller cost than several prominent breeds tested at the same time. . . . . The most prominent merit in large Yorkshires is their power to make a good quality of lean bacon. . . . . The sows produce an average of eight to twelve suckers, and are careful mothers, and good milkers. The young grow quickly, and attain a good weight at an early age."

Victorian breeders and fatteners, with few exceptions, are not yet alive to the exceptional merits of the large Yorks, and many do not even know the difference between this and the Middle York breed which, though inclined to produce too big a percentage of fat, has become so popular in this country. The countries which lead in the production of high-class bacon for supply to the British market are Denmark, Ireland, and Canada, and it is the general use of the Large York boar on other well-bred sows which has enabled the fatteners of those countries to produce bacon commanding the highest price. The demand in England is the same as in this country, viz., a young, juicy, tender, mild cured bacon, with a big percentage of lean. The above-named countries have been able to meet the demand by the use of the Large York boars.

The United States of America is the biggest bacon producing country, approximately half the total number of pigs in the world being there. They are very large exporters of bacon, &c., to the British market, but this is of low grade, and sells for 1d. or more per lb. less than that of Denmark, Ireland, and Canada. According to a recent issue of the report of the Board of Agriculture and Fisheries, London, the United States Department of Agriculture is appointing a commission to investigate the business, as they find it advisable to improve the quality of their product. Further comment is needless.

On account of its mild climate, and other conditions, this country is better adapted to the production of bacon than any of the above-named countries, but our share of the trade so far is insignificant. The future should see an enormous development in the export trade of bacon to Britain. But first of all it is imperative that we should recognise the lines on which the industry must be developed if we are to compete successfully. In this we should benefit by the experience of those countries which have attained such high results.

LOTUS OR BIRD'S FOOT TREFOIL.

Of the Legumes, the Lotus, or bird's-foot trefoils, have not hitherto received much attention in Victoria. In common with clovers and medicks, they are introductions from the Old and New Worlds, for none of them is truly indigenous to Australia. They are easily recognised by their large yellow flowers and slender seed-pods spread out like the toes of a bird's foot.

The bird's-foot trefoils belong to the Lotus family of the botanical order *Leguminosa,* and of these there are several species here: some perennial, others annual. Among the former are *Lotus major v. uliginosus,* or greater bird's-foot trefoil, locally known as Beech Forest clover, which thrives in moist land and does not object to acid, peaty soils, and *Lotus corniculatus,* or lesser bird's-foot trefoil, which remains in flower all the summer, and shows a predilection for poor sandy hillsides.

Of the annuals, there are *Lotus tetragonolobus,* or winged pea, *Lotus hispidus,* or Boyd's clover, which will grow among bracken, and whose roots extract nourishment from the creeping roots of that fern. Then there is *Lotus augustissimus,* which is now being largely grown in the Auckland Province of New Zealand, where it accommodates itself to every variety of soil, and is reported there to give heavy yields of hay up to three tons per acre. Lastly there is *Lotus Australis*. which has been found in recent years, and which may possibly be a hybrid developed under Australian conditions of soil and climate. There is also a variety, which, so far, has not been met with here—*Lotus Americanus,* or Hosackia, commonly called Dakota vetch, which is largely used as a fodder plant in the north-west of the United States of America.

In France, where these trefoils are grown in the warm dry parts of the centre and south-west of that country, their culture has lately been ably and warmly advocated by Prof. M. E. Schribaux, of the School of Agronomy, Paris, and by M. Rabaté, Inspector of Agriculture. The climate of the centre and south-west of France in some respects resembles that of the moister parts of Victoria; it is wet in winter and dry in summer, and is a prolific neighbourhood for the bird's-foot trefoils.

The Lotus family does not object to undrained land, and where cultivated the different varieties can be relied on to give two cuts in the year, and a liberal aftermath. When mown for seed, they yield best on the second cut. Lotus will not bloat live-stock, and the hay is of a high quality. Lotus is remarkably free from any of the diseases such as violet rhizoctonia or downy mildew (*Peronospora trifoliorum*), and leaf-spot of *négril,* which ravage lucerne grown in some parts of France. Being leguminous, it forms nitrogenous nodules on the root system, and thereby increases the fertility of any soil and responds to phosphatic fertilizers. Its greatest advantage lies in the fact that it lasts indefinitely, and when once introduced it will be found to have come to stay. The plant is naturally not without defects, and these have been clearly summed up by Prof. Schribaux:—

1. It is liable to attacks of dodder, but this is negligible, because the dodder filaments are so fine that most farmers do not even notice them. However, it is possible to avoid this parasite by sowing clean seed from some reliable firm of seedsmen.

2. On fertile soil the stems of Lotus get laid very readily, and are not easily mown; but by growing it with cocksfoot, timothy, or prairie

grass, or even creeping bent grass, the stiff stems of these latter will support it.

3. The yellow flowers and the seed-heads are as a rule avoided by live stock, as are those of white clover, probably because both contain a cyano-genetic glucocide which, under the influence of a fermenting agent, or enzyme, becomes converted into glucose or grape sugar and hydrocyanic or prussic acid. This, however, is really an advantage, in that it allows the seeds to open and to reseed the paddock, and thus ensure the plants becoming more lasting on the ground.

4. The cost of the seed is its greatest drawback. The latest quotation in Melbourne is 4s. 6d. per lb., but the seed being very tiny, a relatively small amount is required to be sown. In France it is sown at the rate of 4 lbs. per acre. In New Zealand, locally-grown *Lotus major* is quoted at 2s. 7d. per lb. in Auckland, and *Lotus augustissimus* as low as 1s. per lb.

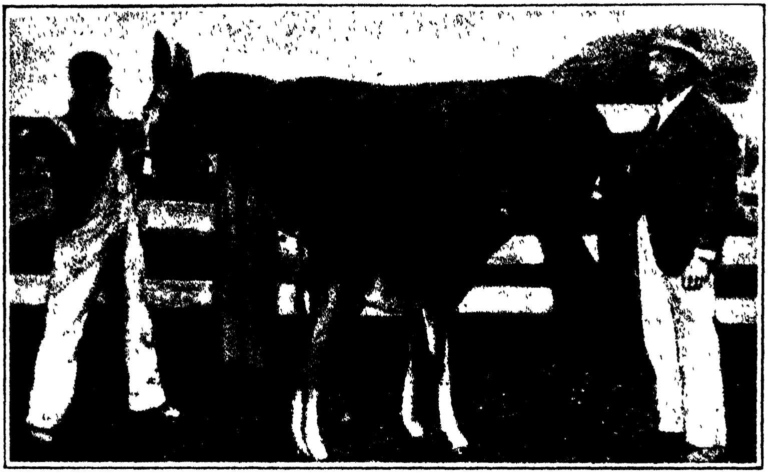
5. Lotus having been cultivated for comparatively few years, the seed is derived from quasi-wild plants, which furnish a rather variable return. However, by selection in future, better strains than those we have now will be obtained.

Prof. Schribaux advocates the sowing of the following mixtures:—On fair average fertile land of good rainfall, cocksfoot, tall oat grass, and Lotus, of each 6 lbs. per acre. On light soils in parts less moist, Lotus, 8 lbs.; tall oat grass, 8 lbs.; cocksfoot, 2 lbs.; Hungarian forage grass (*Bromus inermis*), 12 lbs. per acre.

In Victoria, Lotus will grow in practically all the moist districts, especially south of the Divide. It is readily started in a grass paddock at the time of top-dressing by sprinkling a handful of seed, either pure or mixed with other clovers, on top of each bag of phosphatic fertilizer as it goes into the manure-box of the drill. This may be done at any time of the year when work on the farm is lightest, for Lotus and clover seeds retain their vitality in the soil for a long while, and when the weather is most suitable they will germinate under the stimulus of a neutral or alkaline phosphatic state of the soil. Captain A. E. T. Payne, at Yarra View, has found *Lotus major* growing among rushes, and, in order to eat the Lotus, cattle have grazed down the rushes as well, and so kept the latter in check.

The existence in Lotus and white clover of a cyano-genetic glucocide and its attendant enzyme was discovered by a French observer, M. Mirande, in 1912. It appears mostly in wild specimens of these plants. Prof. Stapledon found that 118 samples of wild white clover all gave a positive reaction, whereas of 126 samples of commercial white clover only seventeen positive reactions were noted. It is an interesting fact that fourteen samples of New Zealand white clover all gave a positive reaction to the test, and of 51 samples from North America, all but one reacted positively. It has also been noticed that seed obtained from dense hoards in old and standing pastures is more likely to react positively than seed obtained from leys of one or two years' duration. This cyano-genetic glucocide resembles in some respects that found in sorghum or kaffir corn, the consumption of which at certain stages of growth leads to disastrous results when eaten by live-stock, on account of prussic acid poisoning. No ill effects, however, have ever been observed from the eating of any part of white clover or Lotus plants.

A MULE WITH A FOAL.



The mule is in almost all cases incapable of producing young. However, "the exception that proves the rule" is shown in the above illustration taken from an American paper. The owner of the mule is Mr. T. B. Neely, Illinois, U.S.A.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist

The Orchard.

YOUNG TREES.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

FUMIGATION.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once. and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at nighttime or on a cloudy day, if the foliage of the trees be thoroughly dry.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

HORSES.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

CATTLE.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the droppings, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available. It will pay well to feed crushed oats to good cows.

PIGS.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now. Pollard should be used for very young pigs, and bran for suckling sows, and to help to prevent constipation.

SHEEP.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks for ewes with early-born lambs. Where possible, castrate ram lambs immediately. Good prices promise for mutton, and particularly for lamb.

POULTRY.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a

liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

BEE-KEEPING.

Since the end of November the season has been quite abnormal from the bee-keepers' point of view. Owing to frequent cold changes and southerly winds but little surplus honey has been stored from Yellow Box and Redgum, even in favoured localities, so that the total yield will be far short of what was expected.

Grey box, which is considered to be our most dependable honey tree, is well budded, but the flowering will apparently be late in some districts—too late to be of any use to bees, unless we have an exceptionally warm autumn.

During February bees commence to arrange their stores of honey and pollen in preparation for the coming winter, and it is therefore unwise to interfere with the combs in the brood chamber, to insert empty combs between the brood, or to change the position of the combs.

Where there is a surplus of honey in the upper story, it is best not to take the whole of it in one operation, but to take half, and when the emptied combs are filling up again take what was left. At this time of year bees will work better and keep on breeding longer with a full, or partly filled, super than with empty combs above the cluster of bees.

When there is a shortage of honey in February or March, it is best to give only enough sugar syrup to carry the bees through till April, but to give whatever amount is necessary in the shortest possible time. Feeding extending over many days will stimulate brood-rearing, and a few weeks later the bees will be short of food again, compelling further feeding.

In the case of colonies below the normal strength in the number of bees, continuous light feeding will do no harm; it will, on the contrary, be beneficial, as it increases the number of young bees, but the feeding for winter stores should be deferred till the middle of April, when but little of it will be used for brood rearing.

CULTIVATION.

Farm.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

Orchard.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

Vegetable Garden.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

Flower Garden.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

Vineyard.—Select scions, if not done last month. In cooler districts, where ripening is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

***Cellars.*—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price 6s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.**

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BEET SUGAR INDUSTRY.

SUGGESTED IMPROVEMENTS AT MAFFRA FACTORY.

Investigation in America.

Towards the end of last year, Mr. Williams, the manager of the Maffra Sugar Factory, visited the United States of America to obtain information to enable the Government to decide the best way of increasing the capacity of the Factory. A copy of a report submitted on the subject is appended, as well as a copy of a general report of Mr Williams' investigations into the Beet Sugar Industry in America.

Recommendations Regarding Maffra Factory.

As a result of my visit to America, I wish to recommend that the Maffra Sugar Factory be reconstructed as soon as possible, to increase its capacity from 300 to 600 tons of beets per day. The American type of plant is desirable, because it is specially designed for efficiency and economy of labour and material. Our conditions are very similar to those of America.

The cost should be, approximately, £100,000.

The task of reconstruction will be more difficult and intricate than the construction of a new mill, and could hardly be undertaken by contract. Consequently, I recommend that a first-class beet sugar engineer be secured to plan, specify, and lay out the whole work, and, if possible, supervise the reconstruction. Thoroughly qualified engineers for this class of work are very hard to procure; and in the absence of sufficient authority, I deferred action until my return, and attach herewith my proposals and the possibilities for proceeding with the work.

It is desirable, and may be possible, to lay out the work from February to June, 1923, and reconstruct from July, 1923, to February, 1924, in time for the 1924 manufacturing season.

1. I consider the investment essential for many reasons, but mainly because the present factory plant is old, inefficient, and uneconomical.

2. Reducing prices of sugar call for labour-saving machinery and a larger turnover.

3. Irrigation offers important possibilities for expansion in our district, which is undoubtedly suitable for beet growing.

4. American beet sugar manufacturers consider a 500 ton per day mill the minimum size desirable.

I am submitting a list of likely alterations to the present plant as a basis for full consideration.

Later on it may be necessary to install pulp driers, and I would like to give every consideration to the possibility of manufacturing power alcohol from our molasses, which at present is not saleable to advantage.

Whilst admitting an element of risk in the extension of any industry, and especially one which is practically new to us, the advantages of successful expansion of rural industries are so great that the risk is well worth while. Furthermore the industry has reached a stage where it must definitely step forward on safe lines or hopelessly drift back.

Assuming that the Factory is reconstructed on a 600 ton per day basis, I estimate we should be successful with a full area of 4,000 to 5,000 acres, and allow per pound of sugar produced—

To growers for beets	1½d. per lb. of sugar
Manufacturing costs ..	1d. " " " ..
Overhead expenses and profit ..	½d. " " "
Total	3d.

Towards reconstruction we are in credit, though the amount is unreserved, for—

	£
Depreciation	25,309
Profit	20,187
Total	45,496

Beet Sugar Industry in America.

Herewith I am submitting a general report of my investigations into the beet sugar industry of America in as far as it may be of serviceable interest towards the Maffra Beet Sugar Factory.

As leading up to the investigation, I propose very briefly indicating the position at Maffra.

The Maffra Sugar Factory was constructed in 1898, and operated for two seasons unsuccessfully, when it passed into the hands of the State Government as chief creditor. One calls to mind that America experienced many failures at the start with their small factories and lack of experience, and not until they developed larger plants and organizations suitable to their peculiar requirements did success come.

Although beet growing experiments continued, the Maffra Factory remained closed until 1910, when it reopened on experimental lines. Owing to indifferent seasons and various initial difficulties, the results for some time were not as satisfactory as hoped for. Recently conditions have been more favorable, and the operations in field and factory have become better understood and more fully appreciated. The result is that the losses incurred since the balance-sheet period (1912-13) have been made good, a profit of £20,187 has accrued, and the plant has been fully depreciated. This season growers became so interested that an area well in excess of the present plant's capacity was offered, and quite an extensive acreage had to be reluctantly refused. Furthermore, the Government irrigation scheme for Maffra and district is well advanced, and, as a result, it is reasonably expected that beet-growing will attract wider attention, and considerably expand its acreage.

The present factory plant is old, inefficient, and uneconomical, and its capacity is not now considered large enough to economically cope with present day conditions.

Growers need attractive prices to grow sugar-beets, but the price of sugar is decreasing in Australia, and the only way to successfully meet the situation is to reduce manufacturing costs by treating larger quantities of beets with the most up-to-date labour-saving and efficient machinery.

These considerations, coupled with the importance of developing rural industries, influenced the Government to institute inquiries into the beet-sugar industry of America, with a view to bringing the Maffra plant up to date.

I left Melbourne on 22nd August, reached California on 21st September, inspected some of the most important sections in America associated with the beet-sugar industry, left there on 10th November, and reached Melbourne on 9th December, 1922. The following factories and places of interest were visited:—

Waialua Cane Sugar Factory, Honolulu.
C.P.C. Pineapple and Alcohol Works, Honolulu.
Honolulu Ironworks, Honolulu.
Anaheim Beet Sugar Factory, California.
Oxnard Beet Sugar Factory, California.
Manteca Beet Sugar Factory, California.
Brighton Beet Sugar Factory, California.
Greeley Beet Sugar Factory, California.
Eaton Beet Sugar Factory, California.
Fort Lupton Beet Sugar Factory, California.
Toledo Beet Sugar Factory, Ohio.
"Larro" Stockfeed Mills, Ohio.
Western Sugar Refinery, California.
Mason By-products Factory, California.
Department of Agriculture, Washington.
A number of agencies and offices associated with the beet sugar business.

The large amount of time required for travelling allowed but a very limited period for the direct investigation of the industry. Everything seen was very interesting, and those associated with the industry extended every possible courtesy and assistance.

Throughout America the industry has recently experienced a severe crisis. During and after the war sugar prices soared to extreme heights (1s. 3d. per lb.), with the result that, during the boom, a great many reckless liabilities were incurred. From extremely high, prices suddenly receded to extremely low, some factories accepting as little as 2d. per lb. for their sugar. This sudden unfavorable change naturally occasioned serious losses and difficulties, but also brought some good steadying results in its train. The factories applied rigid economies, while manufacturers and growers came together, and arranged a safe and fair system of price-fixing for beets. The companies now guarantee a minimum price for a standard quality beet, the price to advance with the sugar content and the selling price of the resultant sugar.

This is the application of a very desirable co-operative principle, and will help to steady and stabilize the industry, and safeguard the interests of all parties.

As a result of the sugar crisis all factories met with trouble, and some became rather seriously involved financially. The beet acreage naturally decreased somewhat, but with sugar values now very firm the situation ahead appears to be quite promising.

The favorable way in which the factories as a whole weathered the storm is one of the strongest reasons for recommending an extension of the industry at Maffra. One may easily gain a favorable impression when things are booming, but when the industry has successfully survived so severe a test, its tenacity appears a most important, safe, and commending characteristic.

Throughout California, beet-growing has recently experienced very hard times, for, in addition to the extreme and disconcerting variations in sugar prices, pests and diseases have been particularly troublesome.

Nematodes or minute eel worms attack the beet roots, and absorb the sap to such an extent that the beets become stunted and fibrous. The size of the roots and the sugar content are both seriously affected, and the resultant crop often becomes quite unprofitable. Rotation appears to be the only useful remedy, and as the nematodes live and develop on many crops, the best rotation for infested lands is to be found in grain and hay crops.

The white fly, a leafhopper which periodically attacks the beets in California, is quite a problem. Clean farming and good cultivation are recommended, but no really effective remedy has yet been found.

As at Maffra, cutworms, white grubs, and other pests sometimes cause trouble, but may be controlled.

A creeping weed, commonly called "Morning Glory," has in a few sections, impoverished the soil, and is very hard to cope with. These troubles are mentioned to indicate the importance of applying scientific methods and clean cultivation in beet-growing, so that healthy and profitable crops may be encouraged to the utmost by wholesome farming.

California's strongest point seems to be the exceptionally high sugar content of the beets grown there. Beets ranging from 17 to 19 per cent. are usual, while other States run from 14 to 16 per cent. of sugar. It is to be hoped that this very strong point may encourage those interested in the industry to develop successful means to combat the pests and diseases recently so prevalent in California.

In this State are located the largest beet sugar factories in America. At one of these factories a most interesting experiment is being conducted by the Oliver Press Company for the filtration of first carbonatation juices.

The new Oliver thickener, with a series of filter pipes under vacuum, partially filters the juice, and the thickened remainder passes to an ordinary Oliver filter press, which completes the work with a minimum of labour and filter cloth. The results appeared to be very satisfactory, and the outfit both efficient and economical. Other factories will probably give it an extended trial next season, and in remodelling the Maffra plant this method is well worth consideration.

Another factory is installing a complete plant for distilling its molasses into industrial alcohol, carbon dioxide gas, and other by-products which are expected to prove profitable. This is a matter of special importance at Maffra, which has too small a production of molasses to safely introduce the Steffens de-sugarizing process. The manufacture of power alcohol is quite feasible and well worth consideration.

Colorado and the beet sugar States of the mid-west and north-east appear to have the sugar industry strongly and safely established. As much time as possible was spent in Colorado, because at the moment it is undoubtedly the ideal beet sugar State.

Amongst others, the Great Western Sugar Company is strongly established there, and near by with sixteen factories, controlled by a first class organization. Travelling expert supervisors are constantly moving from factory to factory, and a wholesome competitive spirit is abroad to promote efficiency and speed.

The beet lands of Colorado are high class, irrigated, and generally well cultivated. Heavy seeding is practised, and rotation of crops encouraged. Alfalfa, to potatoes, to beets is there considered the most desirable rotation. Beet pests and diseases are well controlled by the companies, who specialize in all matters pertaining to the welfare of the industry. There is a general tendency to widen the beet rows from 18 inches to 20 or 22 inches. No beet harvesting machine has yet been adopted, but the problem is receiving considerable attention, and a machine suitable for large areas is likely to become available.

All beets delivered at the factories or sidings are now cleaned and dumped by ingenious mechanical devices, the weeds and dirt being returned to the growers. Colorado has one special difficulty in the storage of its beets. The beets do not reach maturity until rather late in the autumn, and the harvest period is necessarily brief owing to the risk of hard frosts. As a result, large quantities of beets have to be stored in piles 9 feet high, and subsequently re-loaded and forwarded to the factories at the end of the season. This involves additional costs for handling as well as a considerable loss of sugar, and it is fortunate that our district has no such difficulty to contend with.

For the 1922 season, thinning, hoeing, weeding, and topping by contract cost growers $18, or £3 15s., an acre, but this rate may advance

A large number of farmers now grow small areas of beet, and attend to most of the labour themselves. Full costs of growing run about £10 to £12 an acre, and yields are expected to average 10 tons, worth a minimum of £10 8s. 4d., and probably £15 12s. 6d. if sugar prices continue firm.

Profitable use is made of the beet tops for stock feed. Beet-growing costs are generally higher at Maffra than in America, but this is likely to be offset by the better yields that may be expected under irrigation in our district.

Regarding factory matters, our class of general labour is probably more capable, but less keen, than the American general labour.

Our plant is naturally less efficient and uneconomical, but may be satisfactorily reconstructed.

By mechanical and managerial efficiency, the Americans are getting wonderfully improved results from their factories. Speed of process is the successful keynote in manufacture, as it has been found to make for efficiency as well as economy.

Special efforts are continually put forward to eliminate weeds and rubbish. Heating and refining methods are always under consideration for improvement. Speed and continuity of process are encouraged. Scientific investigation is receiving greater attention, and the production of fine, attractive, well-graded sugars has been very successful.

Under difficult conditions, the Maffra plant has accomplished good results, but with an up-to-date plant it may be expected to produce an improved sugar more economically. To increase the factory's capacity from 300 to 600 tons of beet per day the following requirements are submitted as a basis for consideration:—

Additional beet bins and flumes.
Trash catchers.
Enlarged lime kiln.
* Automatic scales.
* New Maguin beet slicer and fittings.
Chains for diffusion battery.
Diffusion measuring tanks.
New first carbonators, complete (4).
Rearrange second carbonators and sulphur tanks.
* New sulphuring outfit and rotary burner.
* New plate and frame presses (5) for first carbonators or two new type Oliver thickeners and presses.
Rearrange old presses for other filtration.
Rearrange evaporators for vapour heating and consider a fifth effect.
Install eight or ten juice heaters complete.
One new white sugar pan, complete, with condensing outfit.
Rearrange old pans, supply tanks, &c.
* Install one set of five new centrifugals, and add two to present set. Consider electric drive for these.
Rearrange granulator with screens, hoppers, &c.
Crystallizers are O.K.
*Install automatic sugar scales, sewing machine, and belt conveyors.

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* These items may have to be purchased abroad, the balance should be procurable locally.

Rearrange mixers, blowups, tanks, &c.
Move twenty cellar tanks outside for molasses storage.
Construct 500-ton molasses tank.
New Corless type engine, driver connected to generator (about 500 h.p.).
Electric transmission, motors and centrifugal pumps.
Four new Babcock & Wilcox boilers, complete, with mechanical stokers (about 350 h.p. each).
Coal handling system and ash flumes.
General factory rearrangements.
General yard rearrangements.
Supervision and incidentals.

Reconstruction of an old plant is more difficult than the construction of a new factory, and should have the services of an experienced and competent beet sugar engineer. Consequently, proposals and estimates for this work have been submitted separately.

When the supply of beet pulp increases at Maffra, it may be desirable to install pulp driers to deal with part of the pulp. The capital expenditure and manufacturing costs are usually high, but the dried pulp is worth from £4 to £5 a ton, and, no doubt, a market could be developed. Furthermore, it is often impossible to satisfactorily store large quantities of green pulp.

Molasses is the other important by-product of the beet sugar industry, and as it is not always saleable to advantage, some profitable means of dealing with it is very desirable. The Steffens de-sugarizing process has been well considered, but the quantity available for treatment is hardly sufficient for the amount of capital involved for the necessary plant.

Molasses may be burned for fuel, but there are difficulties associated with this.

The manufacture of power alcohol or motor spirit suggests itself as a useful and probably a profitable means of treating the molasses.

A formula for a motor spirit considered suitable for ordinary motor engines without alteration is available. The cost of the plant should be reasonable, and a good deal of the necessary manufacturing work could be dealt with during the off-season period. Alcohol plants were inspected, and the demand for motor spirit in Australia warrants consideration of this possibility.

Mechanical, technical, and manufacturing details of the beet sugar industry were inspected as closely as possible, and a great deal of useful information is held for factory use.

Beet seed growing has declined in America, as European supplies are again normal. At the same time, the business will be continued on a limited scale to encourage, by competition, the supply and use of high-grade seed. Dr. Townsend, of the Department of Agriculture, is continuing the extended experiments commenced many years ago to procure a single-germ beet seed. About 60 per cent. result has so far been gained, and in due course it is hoped that the desired seed will be developed, when it is expected, as a result, that the cost of beet thinning may be considerably reduced.

The following brief particulars are submitted as relating to the beet sugar industries of Maffra and America:—

MAFFRA SUGAR FACTORY.

Manufacturing Results.

Year.	Acres Harvested.	Beets Worked	Sugar Content.	Purity.	Sugar Produced.	Extraction
		tons.	per cent.	per cent.	tons.	per cent.
1915	990	8,843	17·2	84·7	1,182	13·36
1916	461	4,928	15·45	85·7	560	11·37
1917	1,320	15,159	15·85	85·9	1,948	12·85
1918	1,200	14,487	14·45	80·5	1,650	11·39
1919	1,009	12,289	13·49	82·0	1,263	10·28
1920	1,080	13,084	15·0	84·4	1,551	11·86
1921	1,180	7,147	15·13	83·4	833	11·65
1922	1,602	16,578	14·90	81·2	1,872	11·29

Two thousand three hundred acres have been planted for 1923.

UNITED STATES OF AMERICA.

Year.	Factories	Acres.	Yields per acre	Beets.	Sugar.	Sugar Content	Purity.	Extractio
				tons.	tons.	%	%	%
1919-20	89	692,455	9·27	6,421,000	726,451	14·48	82·84	12·34
1920-21	97	871,676	9·79	8,538,000	1,089,021	15·99	83·96	13·63
1921-22	92	814,988	9·55	7,782,000	1,020,489	15·77	83·09	13·76

* In many factories the Steffens Desugarising Process improves the extraction percentage.

The 1922-23 results are not yet available, but the acreage was reduced, and the production lowered, because of the very low sugar rates. With improved prices for sugar the results for 1922-23 are expected to be very satisfactory.

The State of Colorado produces nearly 300,000 tons of sugar, and one company—the Great Western Company—has sixteen beet sugar factories and a capital of over £6,000,000.

The world's sugar requirements are at present considered to be about 18,000,000 tons per annum, but with easier prices and a rising standard of living the demand is expected to increase and prices remain reasonably firm. Sugar is one of the very cheapest energy-producing foods in use, and both cane and beet production are necessary to maintain the needful supplies.

In America, beet sugar is grown mainly with white labour, and produces about 800,000 to 1,000,000 tons per annum. Cane sugar is grown mainly with black labour, and yields about 250,000 tons per annum. America consumes 4,000,000 tons per annum, and absorbs the greater part of Cuba's large production.

Australia's consumption is approaching 300,000 tons per annum, and over a term of years the cane industry has not fully met requirements. With an increasing population and demand, there is scope for increasing production of both cane and beet sugar.

The Maffra soil and climate, with irrigation added, are undoubtedly suitable for sugar beet growing. The amount of employment and the production of wealth per acre devoted to beet are so great that the industry's economic advantages to the country are quite exceptional. Five thousand acres of beet should employ 750 men directly, and a large number indirectly, and produce sugar worth about £200,000. This would promote population and develop a local market for other farm products. Agricultural methods would be improved, and, because of its by-products, the industry harmonizes well with dairying and stock-raising. Its many indirect advantages are now well known.

Two important lessons are promptly learned by a visit to America. By comparison, one comes to realize what is not generally understood, that Australia is a land of vast possibilities and wonderful resources, with exceptionally favorable conditions for development.

Also, Australia seriously needs a very much larger population.

The beet sugar industry has so many industrial, commercial, social, populating, and decentralizing advantages that one feels safe in advising an extension of the industry at Maffra. As it would cost about £250,000 to build a new 600-ton factory, further extension in the way of new factories might wisely await results at Maffra. At the same time, it may be said that if a full supply of standard quality beets can be produced, an up-to-date factory could be expected to prove successful.

Following careful inquiry and consideration, a recommendation has already been submitted to reconstruct the Maffra plant and increase its capacity from 300 to 600 tons per day. If the proposals are approved and carried out, the success of the industry will very largely rest with the growers. In their own interests, they will need to see that reasonably full supplies of beets are consistently produced, regardless of prices prevailing for other crops.

Through a term of years, experience has shown that the reliability of, and steady prices prevailing for, the beet crop make it one of the safest and most advantageous crops that can be grown, and well worth the continuous loyalty of the farmers interested therein. Last season, some Colorado growers withdrew from beet-growing, thereby exposing their factories to risk at a critical time, but the cabbages and tomatoes grown by them were largely a financial failure, and the promises to grow beets for next season are now excellent.

The beet sugar industry at Maffra needs a good deal of thought, energy, and loyalty. Granted such, it should be a success.

DENMARK'S BEST COW.

It will interest dairymen to learn that Denmark's best cow for last season yielded, during the year, 20,768 lbs. of milk, making 958 lbs. of butter. She is a big, well-developed cow of the Danish race of milkers, and weighed nearly 1,800 lbs. before her last calving.—*South African Dairyman,* January, 1922.

NHILL CROP AND FALLOW COMPETITIONS.

Report of the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer, Victoria.

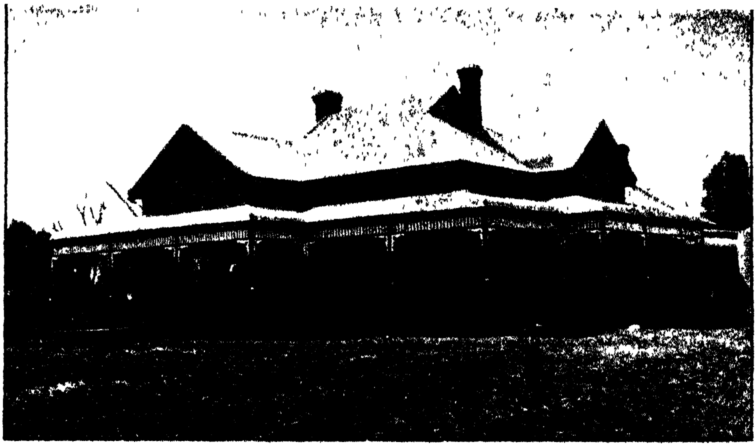
The Nhill Agricultural and Pastoral Society holds its annual crop and fallow competition for the purpose of improving the standard of farming in the district. The competitive spirit stimulates better workmanship, the discussion induced between farmers results in clearer thinking and greater receptivity of new ideas, and the critical examination and comparison of the various crops and methods by the judge lead to publicity being given to the best local practice. The nett result is progressive improvement.

Attractive farm residence and garden of Mrs. A. P. Dufty, Lorquon.

The present competition is the twenty-first organized by the society. No other society in the State has a record half so good. The improvement wrought has been substantial. To local farmers, however, it is likely to be less obvious than to those in a position to make comparison with other districts. In an area so extensive and so well farmed as is the Wimmera, it is difficult to make distinctions, but it can be stated without fear of contradiction that in the percentage of farmers who have adopted those practices which have been persistently advocated as fundamental for heavy crop production, Nhill leads the way. Nhill farming is good whether measured by the percentage of crop grown on land which is summer-fallowed, or by the thoroughness of the cultivation given the fallow, or by the extent of the use of improved seed wheat, or by the amount of seed and manure used per acre.

In the open section, this year, the crops placed first and second were grown on summer-fallowed land, as indeed were the bulk of the crops shown. Again, Mr. C. F. Reichelt, a competitor whose crop was grown on winter-fallowed land, had practically lived on the fallow on which his crop was grown; it had been worked over in all thirteen times. The average quantity of seed used by the competitors in this section was 73½ lbs. per acre, with 96 lbs. of superphosphate. These quantities accord fairly closely with those demonstrated by the experiments conducted by the Department of Agriculture at the Longerenong College to be the most profitable. The thorough cultivation given by Mr. Reichelt meant that he had stored the maximum supplies of water in the fallow and created full supplies of plant food.

Mr. W. E. Dahlenburg is another who leaves no stone unturned in his efforts to grow heavy crops. Only 10.03 inches of rain were registered at this farm last year, yet the average yield obtained for 280 acres of wheat—some grown on refractory red land—was about 10 bags per acre. Thorough cultivation, liberal manuring, the use of best seed, &c., are responsible for the result.



Substantial farm residence of Mr. R. Blackwood, Kiata East.

Part of the crop was grown on summer-fallowed land and part on winter fallow. The summer fallow was worked over, including the original ploughing, on eleven occasions. The harrows were largely used. The crop was sown in June with a combined drill, 75 lbs. of seed with from 112 to 120 lbs. of superphosphate being used.

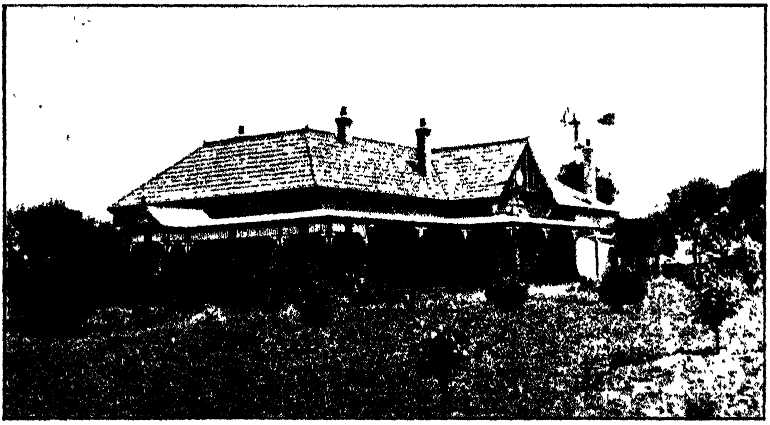
Besides improving the financial side of farming, the Society has endeavoured to build up a sentiment in favour of more comfortable living conditions on the farm, better farm environment, and greater pride in agriculture generally. In that, too, it is succeeding admirably with its farm competitions.

But the influence of the work is not confined to Nhill; it has spread elsewhere. Practically every Agricultural Society in the Wimmera now holds a crop and fallow competition, and the movement has extended to the Mallee, and latterly to the Goulburn Valley. This year twenty-one requests were made by Agricultural Societies for departmental officers. A few years ago there were only one or two Societies interested.

The Competition, 1922.

The autumn was dry, but there was a good spring. The rain, however, fell in a patchy manner. At Nhill, over 16 inches was received; at Salisbury, but 10 inches. The late frost on November 4th, which caught a good many paddocks of wheat in the flowering stage, reduced substantially the number of entries. But several who sustained heavy damage were not deterred from competing, a fact which speaks well for their sportsmanship. In all there were sixty entries in the eleven sections open for competition.

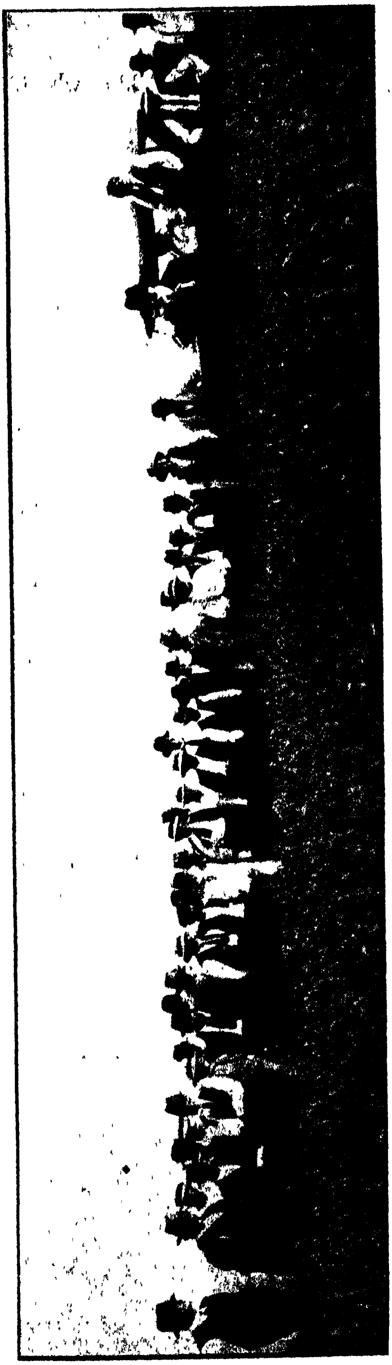
Frost so late in the year is a very rare occurrence. It damaged patches of crop on the low lying ground—that is, on the black flats between the red rises. Usually it extended some distance up any slopes facing the west. Heads were attacked irregularly. In severe cases the whole of the grain in the head had disappeared, but, generally, a portion was left unharmed. Examination proved that the flower in the frosted parts had never opened. Possibly, in the undamaged parts of the head, the flower had been pollinated previously, or it may be that it had not yet formed. Any wheat which flowered earlier or later than the frost was quite undamaged. Interesting in this connexion were some patches of crop which escaped injury though surrounded by badly damaged plants There were diagonal finishes in several paddocks that had been drilled round and round. The overlapping of the drill caused a double dressing of seed and manure. The extra manure had evidently resulted in the heads maturing sufficiently early to have escaped the frost. Classic instances of this were noticed in Mr. H. E. Dahlenburg's crop at Winiam East, and on the farm of Clarence Creek in the same locality.



Comfortable farm residence of Mr. Julius Reichelt, Lorquon.

The damage done to crops in the district was considerable, for the black flats generally grow the heaviest crops. The frosted heads looked quite normal at a few yards distance. They did not possess that blighted appearance commonly associated with frost. Close examination, however, showed that the damaged parts of the head were narrower and devoid of grain. In some instances up to 50 per cent of the apparent yield of the crop was lost. The financial loss was therefore considerable, had the danger been realized at the time it would have been a simple procedure to have prevented damage by the use of "smudge" fires made from damp straw. The fact the flats are part of a well-defined valley formation would help to confine the smoke. The method, of course, would not be applicable to the Wimmera Plains generally.

Difficulty was experienced in estimating the yields of the crops, but a count of the percentage of damaged heads was made in each frosted paddock, and yields reduced accordingly



Gathering at Farmers' Field Day.

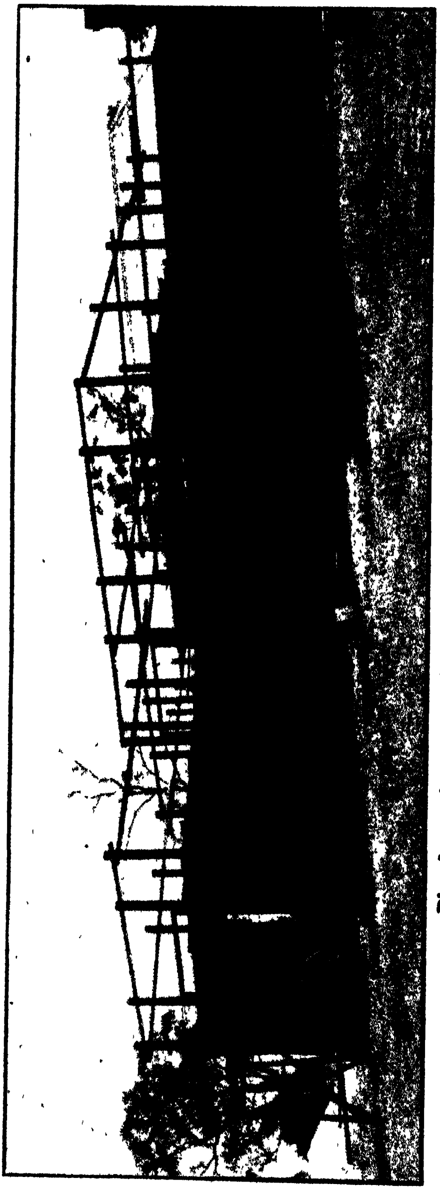
Experimental plots conducted by Mr. W. E. Dahlenburg for the Department of Agriculture.

Results—Section 1.

For the best half (not less than 75 acres) of wheat crop, Mr. Peter Bone, of Kiata East, was awarded first prize and 95 points; Mr. A. P Koop was second with 91 points; Mr. R. Blackwood, 87 points, was next, and then follow Mr. C. F. Reichelt and Mr. W. E. Dahlenburg, with 85 points each. The winning crop comprised three varieties—Federation, Dollar, and Gallipoli. It was well headed, dense and level on top, all characteristics of heavy yield There was some slight frosting The Dollar and Federation were very true to type, but the Gallipoli was somewhat mixed. There was a little wild oats present, but no disease. The wheat was grown on summer fallow. This was ploughed dry in March, scarified in July, and then spring-toothed twice in the spring. In May, it was spring-toothed, and then sown with the combined drill at the end of May.

Seed at the rate of 75 lbs. per acre was used, with 95 lbs. of superphosphate. The soil was typical heavy black flat.

The second prize crop was Federation. The yield of the portion sown last was seriously reduced by frosting. It was an excellent field of wheat, and would otherwise quite possibly have won the competition. The wheat was reasonably true to type, quite free from weeds and any disease whatever. The paddock, black soil, was ploughed from 3 to 3½ inches deep in April, then scarified in July. In October it was worked over with the combined spring-tooth cultivator drill and then harrowed. In the following May it was re-worked with the drill and harrowed, then sown with the combined drill at the end of June and harrowed From 70 to 80 lbs. per acre of seed was used, with 100 lbs. of superphosphate.



Pise house in course of construction (Mr. P. Koop's, Nhill).

Another fine crop was that of Mr. R. Blackwood, of Kiata East. Federation was again the variety exhibited The wheat was very true to type, but frost had helped to reduce the yield slightly The black flat upon which it was grown, prior to fallowing, had two crops of oats taken off in succession. It was summer-fallowed in April, ploughed early in August, with harrows attached, then scarified across the direction of the ploughing in the spring, then harrowed, and then in early November spring-toothed.

After harvest, a fortnight after the first rain, the fallow was re-worked with the spring-tooth and finally sown with the combined spring-tooth drill at the end of May and early in June. 75 lbs. of seed were used and 112 lbs. of superphosphate.

Mr. Reichelt's winter fallow was ploughed in June, and early in July, to a depth of from 3½ to 4 inches. It was then harrowed twice to cause wild oats to germinate. In August it was cultivated with the combined spring-tooth drill, and early in September crossed with the same implement. At the end of September the drill was again used. Then the roller was used on some clay banks. This was followed by a spring-tooth cultivating in October. After harvest, following the first rains, the paddock was spring-toothed on the 23rd April. It was again spring-toothed before being sown with the combined drill during the first week in July, using 75 lbs. of seed wheat and 100 lbs. of superphosphate. Two strokes of the harrows were then given. The crop was short-strawed, but very dense. It would have yielded very heavily, but was touched with frost.

Mr. Walter Dahlenburg's crop has previously been mentioned. Three varieties were sown—Crossbred 7063, Dollar and Federation.

The crops shown by Messrs. Landers and J. and T. W. Rintoule would have been exceptionally heavy but for bad frosting.

DETAILS OF AWARD—SECTION 1.—FOR BEST HALF (NOT LESS THAN 75 ACRES) OF FARMER'S WHEAT CROP.

Name.	Variety.	Yield.	Trueness to Type.	Absence of Weeds.	Absence of Disease	Evenness	Total.
Possible Points ..	..	**35**	**20**	**15**	**15**	**15**	**100**
P. Bone	Federation, Dollar, Gallipoli	35	17	13	15	15	95
A. P. Koop ..	Federation ..	29*	18	15	15	14	91
R. Blackwood ..	Federation ..	29	19	12	13	14	87
C. F. H. Reichelt ..	Federation, Huff's Imperial, Dollar	31	16	13	10	15	85
W. Dahlenburg ..	Crossbred 7063, Dollar, Federation	31	19	12	11	12	85
J. & T. W. Rintoule	Federation ..	23*	19	14	14	15	85
G. Landers ..	Dollar ..	27*	19	12	10	15	83

* Frosted crop.

NOTE.—The points for yield do not represent bushels per acre, but the differences between them do. The winning crop was heavier than 35 bushels per acre.

Results, Section 2.—Best 100 acres of wheat grown on Mallee land; Mallee fringe debarred.

There were four competitors in this section. The crop submitted by Mr. E. H. Rowe, of Propadollar, was placed first with 83 points. The varieties were Federation, Minister and Major. There were numerous strangers present, but the crop had no weed growth, and was quite free from disease.

The heaviest crop in the section was that of Mr. A. K. Mackenzie, which gained 82 marks and second place. This was a dense well-headed crop, but lost points on the score of disease. Mrs. D. R. Mackenzie's paddock of Hard Federation looked well, but also lost points for the same reason.

The winning crop was grown on land most thoroughly cultivated and liberally seeded and manured. It was ploughed in July to 3 inches deep, harrowed twice, scarified in early spring, then worked twice with the spring-tooth attachment of the combined drill. After harvest it received a further cultivation with this implement following rain. It was sown by the combined drill at the end of June; 80 lbs. of seed were used with 90 lbs. of superphosphate. The soil is of a somewhat clayey nature for Mallee land. If anything the surface, which had run together, was reduced to a condition rather too fine for the class of soil.

Mr. R. Blackwood's crop of Penny Wheat at Kiata East.

DETAILS OF AWARD—SECTION 2.—BEST 100 ACRES OF WHEAT GROWN ON MALLEE LAND, MALLEE FRINGE DEBARRED.

Name.	Variety.	Yield.	Trueness to type.	Absence of Weeds.	Absence of Disease.	Evenness.	Total.
Possible Points ..	.. . ..	35	20	15	15	15	100
E. H. Rowe ..	Federation, Minister, Major	26	14	14	15	14	83
A. K. Mackenzie ..	Federation ..	30	18	11	8	15	82
Mrs. D. R. Mackenzie	Hard Federation ..	27	19	10	10	14	80
J. B. Marshall ..	Penny	22	18	13	11	13	77

Results - Section 3.—For best fallowed black land, not less than 100 acres.

Ten entries were received in this section. Without exception all were splendid examples of careful cultivation. Difficulty was experienced in separating the competitors, and finally resort had to be made to small points of difference. The first prize was awarded to Mr. R. Blackwood, of Kiata East, who scored 98 points. Mr. H. E. Dahlenburg was second with 96. Highly commendable exhibits were submitted by Messrs. C. Reichelt, W. E. Dahlenburg, Alf. Schultz, Dufty and Garton, and Peter Bone. The remainder lost points through minor defects.

The winning paddock of summer fallow on a fine black flat, submitted by Mr. Robert Blackwood, was cultivated to a tilth like an onion bed. The bottom was thoroughly consolidated. There was an absence of weeds, and abundance of moisture had been conserved below. If anything the mulch was a shade shallow; it was about 2 inches deep. Last year the paddock was in oats which were cut for hay. The land was ploughed in February to 4 inches deep. Harrows were attached to the plough. In July half was scarified and half spring-toothed. Subsequently the scarified half was given two further scarifyings, as weeds appeared. The rest of the paddock was spring-toothed instead of being scarified, and finally the whole area worked over with a spring-tooth during the end of October. No distinction could be observed in the moisture content of the two sections, but the resultant crops may possibly show a difference. The early working no doubt contributed to the excellent condition and the high moisture content of the fallow.

Heavy Crop of Federation Wheat—Mr. P. Koop's, Nhill.

Mr. H. E. Dahlenburg's fallow was an excellent piece of summer fallow on a black flat. The land was ploughed up out of grass, and in view of that, its condition was very meritorious. It was disc-ploughed to 4 inches deep at the end of March, scarified early in July, and harrowed. Subsequently it was scarified during the second week in August, harrowed twice, scarified at right angles early in October, and harrowed at the end of October.

Mr. Reichelt's fallow was also summer fallow, after wheat. The stubble was burnt and worked in quickly with the cultivator attachment of the combined drill, so as to incorporate the ashes before wind could disperse them. This was done in April. Then the paddock was again worked with the combined drill in July, and subsequently harrowed twice in September, cultivated with a scarifier early in October, and finally worked with the drill again at the end of October. The result was an attractive fallow in which a few points were deducted because the "bottom" was left somewhat ridged, *i.e.*, the depth of the mulch was uneven.

Mr. W. E. Dahlenburg's paddock contained red patches. These had been handled with judgment.

Mr. C. F. H. Reichelt's crop af Federation Wheat.

DETAILS OF AWARD—SECTION 3.—FOR BEST FALLOWED BLACK LAND (NOT LESS THAN 100 ACRES).

Name.	——	Moisture.	Mulch.	Weeds.	Cultivation	Total
Possible Points ..	..	**25**	**25**	**25**	**25**	**100**
R. Blackwood ..	Kiata East ..	24	24	25	25	98
H. E. Dahlenburg ..	Winiam ..	24	25	23	24	96
C. Reichelt	Woorak West	23	23	25	24	95
W. E. Dahlenburg ..	Salisbury ..	24	23	24	24	95
Alf. Schultz	Woorak ..	24	23	24	23	94
Dufty & Garton ..	Lorquon ..	22	23	25	23	93
Peter Bone .. .	Kiata East ..	23	23	22	22	90
J. & T. W. Rintoule ..	Nhill ..	22	21	25	21	89
F. A. Meagher ..	Nhill ..	22	22	21	23	88
Bryan Dufty ..	Lorquon ..	21	22	21	22	86

Results, Section 4.—Fallow on refractory red soil. Loams debarred.

There were only two competitors in this section. Both showed red land which had been worked with considerable judgment. It is hoped that there will be a larger entry in this section in future, because it is the cultivation of this particular class of land that many are seeking to improve. Mr. C. P. Dahlenburg was awarded 93 points and first prize; Mr. H. Reichelt was second with 91. The winning fallow showed a surface tilth which had not been reduced to too fine a condition. The clods were small and regularly disposed. A few points were deducted for the presence of a slight skin on the mulch. The moisture content was high, but not so good as that of Mr. Reichelt's fallow. The surface soil on the red clay land in this district is very shallow, and it is essential to plough it shallowly so as to preserve the mellow soil near the top. The paddock was ploughed very shallowly in July with harrows attached behind the plough. It is desirable to prevent this soil remaining in big clods and subsequently baking in the sun. Harrowing quickly after ploughing helps greatly. In August the harrows were put over the land, followed by a scarifier as weeds appeared toward the end of the month. The harrows were again used in September. In October part was scarified and part was worked over with the combined drill.

Mr. Reichelt's exhibit lost points because of the presence of some large sun-baked clods.

DETAILS OF AWARD—SECTION 4.—FOR BEST FALLOW ON RED SOIL (NOT LESS THAN 100 ACRES). LOAMS DEBARRED.

Name.	District.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points	.. .. ..	**25**	**25**	**25**	**25**	**100**
C. P. Dahlenburg ..	Winiam East ..	23	22	25	23	93
H. Reichelt	Woorak West ..	25	20	22	24	91

Results, Section 5.—Highest aggregate award for fallowed black land, 1922, and wheat crop grown on fallow, 1923.

The fallows were judged this year. The results are appended. They were the same fallows entered for Section III.

DETAILS OF AWARD.—FALLOW, 1922.

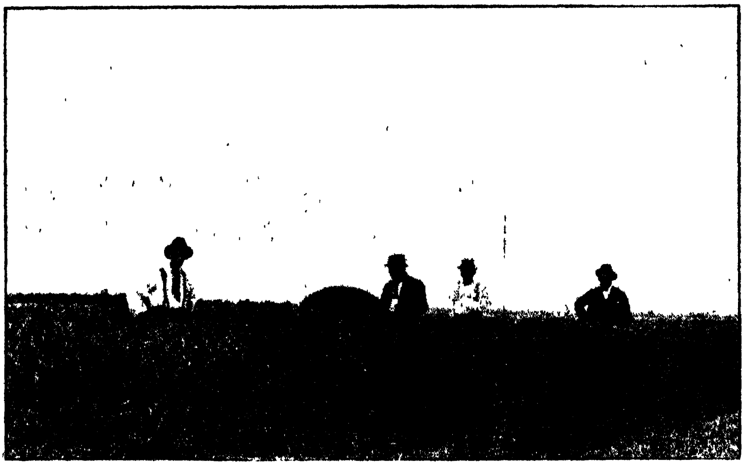
Name.	District.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points	.. .. ..	**25**	**25**	**25**	**25**	**100**
R. Blackwood . ..	Kiata East ..	24	24	25	25	98
C. Reichelt	Woorak West ..	23	23	25	24	95
W. E. Dahlenburg ..	Salisbury ..	24	23	24	24	95
Alf. Schultz	Woorak ..	24	23	24	23	94
Dufty & Garton	Lorquon ..	22	23	25	23	93
Peter Bone	Kiata East ..	23	23	22	22	90
J. & T. W. Rintoule ..	Nhill	22	21	25	21	89
Bryan Dufty	Lorquon ..	21	22	21	22	86

Results, Section 8.—Highest aggregate for the whole crop and fallow for the period 1922-24.

Every acre of fallow on the farm is inspected. The competition is only partially completed. The fallow on Mr. Robert Blackwood's farm was judged most meritorious. Next was that of Mr. W. E. Dahlenburg.

Details of Award—Section 8.—Highest Aggregate for Whole of Fallow 1922; for Whole of Wheat Crop 1923; for Whole of the Fallow 1923; for Whole of the Wheat Crop 1924.

Name.	Moisture.	Mulch.	Weeds.	Consolidation.	Total, 1922
Possible Points	**25**	**25**	**25**	**25**	**100**
R. Blackwood	24	24	25	23	96
W. E. Dahlenburg . .	24	23	23	23	93
H. E Dahlenburg	23	24	23	23	93
Alf. Schultz	24	23	23	22	92
Peter Bone	22	22	22	22	88



Paddock of crossbred, 7063—Mr. W. E. Dahlenburg's, Salisbury.

Section 9.—Aggregate points for crop and fallow on stiff red land.

The competition, now in its second year, has been completed. The result is that Mr. C. P. Dahlenburg is first with a total of 164 marks. The other competitor withdrew. The winning crop was a very satisfactory one for the class of soil it was grown on.

Details of Award—Section 9.—For Fallow and Crop on Stiff Red Land. 75 Acres were Judged 1921. Crop on the 75 Acres Judged 1922.

Name	Crop, 1922.						Fallow 1921. Total.	Grand Total.
	Yield.	Trueness to Type.	Absence of Weeds	Absence of Disease.	Evenness.	Total.		
Possible Points	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
C. P. Dahlenburg	23	18	10	13	13	77	87	164
Johann Reichelt	Withdrawn						86	

Results, Section 6.—Highest aggregate points for the whole of the wheat crop and fallow for the period 1921-1923.

The competition is only partially completed. A further series of crops have to be judged next year. Some competitors had to withdraw on account of badly frosted crops this year. The remainder are very evenly matched. Mr. R. Blackwood leads with 273 points, Mr. Peter Bone is next with 272, Mr. C. Reichelt next with 271, and Mr. W. E Dahlenburg next with 269.

Heavy crop of oats—Messrs. J. and T. W. Rintoule's, Nhill.

DETAILS OF AWARD—SECTION 6. HIGHEST AGGREGATE FOR THE WHOLE OF THE FALLOWED LAND 1921; THE WHEAT CROP 1922; THE FALLOWED LAND 1922; THE WHEAT CROP 1923.

Name	Whole of Wheat Crop, 1922.						Total Fallow, 1921	Total Fallow, 1922	Grand Total
	Yield	Trueness to Type.	Absence of Weeds	Absence of Disease	Evenness.	Total Crop, 1922.			
Possible Points	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**100**	**300**
R. Blackwood ..	31	17	11	11	12	82	95	96	273
Peter Bone .	35	17	11	14	14	91	93	88	272
C. F. Reichelt ..	34	16	12	10	14	86	95	90	271
W. E. Dahlenburg	30	18	11	10	11	80	96	93	269
C. P. Dahlenburg	Withdrawn—frosted crop.								
H. E. Dahlenburg	,,		,,	,,					
H. W. Goodwin	,,		,,	,,					
J. Reichelt ..	,,		,,	,,					
O H. Leinert ..	,,		,,	,,					

Results, Section 7.—For highest aggregate points for crop and fallow on red land.

The competition is only partly finished. The fallows exhibited are the same as those in Section 4.

DETAILS OF AWARD—SECTION 7.—FOR HIGHEST AGGREGATE POINTS FOR FALLOW ON RED SOIL, 1922; AND FOR CROP ON THE FALLOW, 1923.

Name.	—	Moisture.	Mulch.	Weeds.	Cultivation.	Total for Fallow, 1922
Possible Points ..	.. .. ..	**25**	**25**	**25**	**25**	**100**
C. P. Dahlenburg ..	Winiam East ..	23	22	25	23	93
H. Reichelt ..	Woorak West ..	25	20	22	24	91

Section 10.—Competition for Returned Soldiers. Aggregate points for crop and fallow for two years.

There were eight competitors. The fallows were judged in 1921 and the crops last year. The highest aggregate of points was secured by Mr. E. H. Manyard, of Boyeo, Mr. E. V. Eastick was second with 173 points, and F. H. Eastick third with 172. The yields of several of the remaining crops were seriously interfered with by frost. Mr. W. F. Beacom's wheat, unfortunately, was not sown till August.

The winning crop of Federation was sown on virgin soil fallowed in June. It was harrowed, scarified in spring, spring-toothed, scarified in October and harrowed. After harvest it was scarified after rain, re-scarified as rubbish appeared, and sown with a combined cultivator drill in mid-June; 70 lbs. of seed and 90 lbs. of superphosphate were used. Frost had damaged it in parts.

DETAILS OF AWARD—SECTION 10.—FOR RETURNED SOLDIERS.

Prize for highest aggregate points for 75 acres fallowed 1921, and crop on fallow 1922.

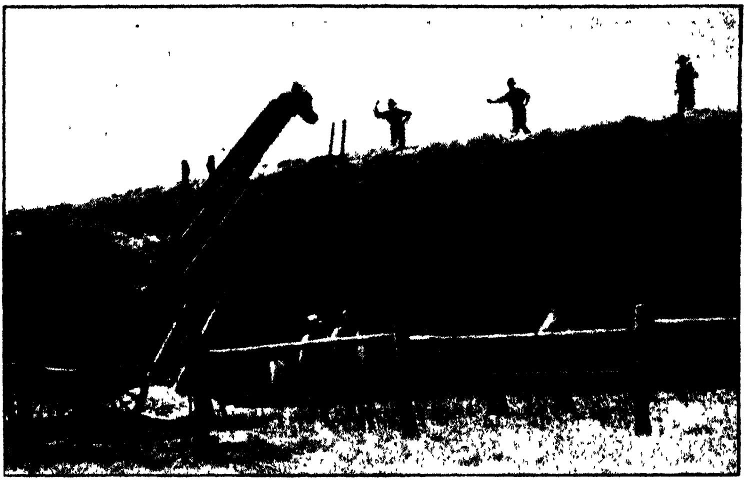
Name.	Variety.	Yield.	Purity.	Absence of Weeds.	Absence of Disease.	Evenness.	Total for Crop, 1922.	Total for Fallow, 1921.	Grand Total
Possible Points .	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
E. H. Manyard ..	Federation ..	29	19	12	15	14	89	85	174
H. V. Eastick ..	,, ..	30	16	10	14	13	83	90	173
F. H. Eastick ..	,, ..	24*	16	15	15	13	83	89	172
Clarence Creek ..	,, ..	21*	17	11	9	15	73	95	168
Gordon Bone ..	,, ..	17*	18	9	8	11	63	93	156
S. J. Smith	Federation, Minister	20*	15	9	10	11	65	85	150
S. Beacom	Federation ..	21	13	7	12	11	64	84	148
W. E. Beacom ..	Federation, Minister	9†	16	5	12	12	54	94	148

* Yield suffered severely from frost.
† This crop was sown in August.

Section 11.

SPECIAL TROPHY PRESENTED BY NOSKE BROS. PTY. LTD., FOR FALLOWED LAND, WITH THE OBJECT OF ENCOURAGING THE USE OF HIGH STRENGTH WHEATS.

There were seven entries. 50 acres of fallowed land had to be shown and subsequently sown with 25 acres of Minister wheat, and 25 acres of Hard Federation. In most instances the fallows exhibited were portions of those entered in Section 3, and have, therefore, been described. Mr. R. Blackwood gained 98 points and first place; Mr. Alf. Schultz was second with 97 points.



Mechanical bag loader at Mr. H. Dahlenburg's, Winiam.

Neat method of stacking manure.

SECTION 11.—SPECIAL TROPHY GIVEN BY MESSRS. NOSKE BROS. PTY. LTD., FOR BEST 50 ACRES OF FALLOWED LAND, UPON WHICH 25 ACRES EACH OF MINISTER AND HARD FEDERATION WHEAT ARE GROWN.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points	**25**	**25**	**25**	**25**	**100**
R. Blackwood . ..	24	24	25	25	98
Alf. Schultz .. .	24	24	25	24	97
G. Batson, junr. ..	23	24	25	24	96
C. Reichelt	23	23	25	24	95
J. and T. W. Rintoule . .	22	21	25	21	89
F. A. Meagher, No. 1	22	23	21	23	89
F. A. Meagher, No. 2	23	21	22	22	88

In conclusion I desire to thank those members of the Society whose hospitality contributed much towards rendering the work of judging less arduous, and especially Mr. Chas. Towns, the secretary, for his help and consideration.

DIETETIC VALUE OF CHEESE.

Official experiments have settled the question of the digestibility of cheese. The chemists have concluded that both raw and cooked cheese are equally easy of digestion when eaten under right conditions. As cheese is a very compact or concentrated food, it is not acted on in the stomach but passed on to the intestines, where it is finally absorbed. It is this very quality of prolonged digestion that has made cheese noted for its "staying" powers, and so valued by both athlete and workman as a mid-day food.

In cheese we find proteid constituents, corresponding to eggs, meat and fish, which must be supplied with the bulk in which it is lacking in order to overcome a tendency to cause constipation. It should be used as a meat substitute rather than as an adjunct to a heavy meal, savouries, cheese custards, soups, Welsh rarebits, souffles or fondus offering almost unlimited combinations to the imaginative housewife. A green salad and graham or entire wheat meal bread, with a tart dessert and simple cakes are suitable accompaniments to a cheese dish.

In buying cheese as a meat substitute, food value should be considered rather than flavour.

There are certain times when cheese adds perfection to a meal—in fact, there are many who think that no matter how limited the dinner, cheese must never be omitted. Brillat-Savarin says that "a dinner without cheese is like a beautiful woman with but one eye."

STANDARD HERD TEST.

Report for Quarter Ended 1st December, 1922.

Hereunder are given the names, along with the respective records, of the successful cows of those which terminated their test during the second quarterly period of the current testing year. The list comprises 150 out of the total of 183 which completed the test.

Owner.	Breed.	No. completed Test.	No. Certificated.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
Mrs. F. M. Akehurst, Tunstall	Jersey ..	2	Nil											
The Mrs. M. I. Alston Estate, Cobram	Jersey .	1	1	Silver Bell of Kameruka .	6038	8 3 22	273	20	6,520	6.06	395.41	250	450¾	284, 383
W. K. Atkinson, Swan Hill	Shorthorn	2	2	Blanche Rose 10th	10892	26.1 22	273	30	10,617	3.74	397.07	250	452¾	296, 402, 423, 405
				Pearl of Willow Park .	10266	23.3 22	273	30	10.404	3·83	398 69	250	454½	328, 393
C. Bamford, Benalla	Ayrshire	6	6	Fuchsia of Medburn Grove .	.	24.1.22	273	17	5,047	4·34	219·82	175	250½	
				Moonlight of Medburn Grove	.	8.3.22	273	13½	5,030	4·03	202 71	175	231	
				Treasure of Medburn Grove ..	.	17 3.22	273	27	8,478	4·54	385·26	200	439¼	240
				Fun of Medburn Grove .	.	19 3 22	273	16	5,916	3·80	224 59	175	256	
				Gaiety of Medburn Grove ..	8300	20.3 22	273	16	7,559	3·87	292 79	200	333¾	213
				Beauty of Medburn Grove	4858	23.3.22	273	15	7,727	4·33	335·22	250	382¼	261, 266
Mrs Irene Beard, Outtrim	Jersey	2	2	Biddy of Kelburn	9639	1 2 22	273	21½	6 612	5·27	348·78	200	397½	
				Garenne 3rd of Warenda	6140	9 2.22	273	18	5,890	5·57	327 81	250	373¾	219
Callery Brothers, Bannockburn	Ayrshire	3	3	Marjorie of Langley Park ..	2839	27 12.21	273	32½	9,836	4·10	403 12	250	459½	401, 441
				Bonnie Jean of Langley Park	3478	15 1 22	273	10	5,927	4·58	272·75	250	311	302, 322, 294
				Fairy Queen of Langley Park	8545	15.3 22	273	4	4,912	4·32	208 05	175	237¼	

STANDARD HERD TEST—*continued.*

Owner.	Breed	No. completed Test.	No. Certificated.	Name of Cow	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
Dr. S. S. Cameron, Hawthorn	Jersey ..	1	1	Duke's Spark of Glen Iris	.	6 2 22	273	12	3 141	6·33	198 97	175	227	
R. C. Campbell, Clarendon, near Lal Lal	Jersey .	1	Nil											
Mrs. M. E. Carroll, Tyntynder Central, near Swan Hill	Red Poll	1	1	Limerick .	269A	9 1 22	273	14½	4 858	4 00	192 69	175	219¾	
P. Chirnside, Oakleigh	Jersey ..	2	2	Werribee Northwood Madiera 6th	6540	12 1.22	273	21½	6,756	5 82	393·50	250	448½	426, 412
				Canary 4th of Lesterfield ..	..	17.3.22	273	13	4,521	6 07	274 49	175	313	
J. W. Cochrane, Moorabbin	Ayrshire	1	1	Queen of Golden Vein ..	8879	3.1.22	213†	22	6,609	3 81	251 82	250	287	
Cockbill and Gibbs, Tandraboo, near Lancefield	Ayrshire	4	2	Jennie of Burnside ..	8906	18 2.22	273	13½	4,878	4·52	220·39	200	251¼	
				Leila of Warrook	5173	25 2 22	273	8	6.435	4·55	293 04	250	334	287, 334, 334
W. J. Colman, Kerang	Jersey ..	3	3	Laurie 2nd of Roseneath ..	6095	18.2 22	249*	17	4,990	5 52	275 21	250	313¾	185, 268
				Starleigh's Princess of Clover Flat	6096	23.2.22	244*	27	7,093	5·17	367 06	250	418½	382
				Queen of Bellaire	9261	1 3 22	238*	15½	6.413	5·76	369 31	250	421	361
W. T. Cullen, Warrion	Ayrshire	2	Nil											

* Herd withdrawn before completion of the lactation. † Sold before completing full term.

STANDARD HERD TEST—*continued*.

Owner.	Breed.	No. completed Test.	No. Certificated.	Name of Cow	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs
								lbs.	lbs.		lbs.	lbs.	lbs	
A. E. Denis, Swan Pool	Jersey ..	2	1	Royal Sun Ray	9710	27 1 22	273	21	6,427	4 47	287·05	250	327¼	339
Department of Agriculture, Burnley	Friesian	2	2	Dominion Belle Corona .	369	18 1.22	252	4	10 518	3·21	337·75	250	385	305, 420, 400
				Dominion Proud Lassie .	368	1 3 22	273	30½	11,336	3 42	387 14	250	441½	343. 381, 334
Department of Agriculture, Werribee	Friesian	2	2	Victoria Dutch Wood	..	29.1.22	273	26½	8,301	3·73	309 81	175	353¼	
				Dominion Coringa .	380	22.3.22	273	44½	14.334	3 38	484 03	250	551¾	481. 460. 499
	Red Poll	16	14	Birdseye	377C	29.12 21	273	8	6,357	4·95	314·55	250	358½	250, 341, 438, 486, 392, 360, 488, 459
				Netherlana	492D	14 1.22	273	23	9,060	4·16	377·03	250	430	186, 278. 402, 404, 346, 329, 300, 286
				Effrontery	295B	15 2.22	251*	16	4.076	4 67	180 58	175	205¾	
				War Bird .	257A	21.2 22	273	18½	6,336	3 78	239 61	175	273¼	
				Chevron .	242A	22 2 22	273	21	6 562	4·15	272·01	175	310	
				Tigra . .	324B	25 2 22	273	28½	7,767	3·92	304·72	175	347¼	
				Bahama	238A	4.3.22	273	20½	6,734	4.36	293 59	175	334¾	
				Three Castles	402C	7 3.22	273	16½	4,677	4 27	199 94	175	228	
				Sovereign .	320B	10 3 22	273	19	6.830	4·42	301·55	200	343¾	263
				Banksia	376C	15.3.22	273	8	6,047	4 59	277·86	200	316¾	241
				La Marseillaise	394C	17 3.22	273	9	6.104	3 86	235·38	200	268¼	251
				Beltana	239A	17 3.22	273	21	6,534	4·11	268·66	175	306¼	
				Victoria Velvet	7AA	18 3 22	273	20	6.134	4·30	263 73	175	300¾	
				War Wings	259A	19 3.22	273	26	8 660	3 91	338·89	200	386¼	289
C. Falkenberg, Elliminyt	Jersey .	1	1	Trixie of Colac ..	1914	25.3 22	273	14½	4,867	5 56	270·83	250	308¾	182, 304, 301, 322

* Sold before completing full term

STANDARD HERD TEST—*continued*.

Owner.	Breed.	No completed Test.	No. Certificated.	Name of Cow	Herd Book No.	Date of Calving	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs		lbs.	lbs.	lbs.	
Flack and Sewell, Berwick	Friesian	3	3	Domino Fobes of Yarrabrae .	266	3.1.22	273	22	9,527	3·27	311·95	200	355½	281
				Prim Patch of Yarrabrae .	..	26.2 22	273	12	8,975	3·41	305·85	200	348¾	244
				Miss Miller 3rd of Berry .	242	27.3 22	264	4	8,128	3·37	274·70	200	313¼	278
Mrs. M. and W. A. Francis, Kilcunda	Ayrshire	1	1	Duchess of Hillcrest	5139	26.2.22	273	13½	4.964	4·36	216·26	200	246½	230
Geelong Harbor Trust, Marshalltown	Ayrshire	11	11	Holly of Sparrovale	7310	2.1 22	273	18	5,446	3 47	188 95	175	215½	
				Janice of Sparrovale	7312	10 1.22	273	20	6,461	4·25	274·28	175	312¾	
				Beanie of Sparrovale	7308	20.1.22	273	26½	8.270	3·65	301·90	175	344¼	
				Primrose of Sparrovale	6359	8.2.22	270	22	6,868	4 62	317·47	250	362	199, 302
				Duchess of Sparrovale	3889	9.2.22	273	5½	7.184	3·77	270·94	250	309	261, 275, 297
				Gladys of Sparrovale	6355	13.2.22	273	14	5,173	4·41	227·90	200	260	278
				Hygeia of Sparrovale	7311	15 2.22	273	17	6.224	4·41	274·30	175	312¾	
				Belle of Sparrovale	3883	18.2.22	273	10½	6,903	4·63	318 97	250	363¾	242, 333, 287, 266
				Clover of Sparrovale	2872	24.2.22	273	15	8,200	5·22	428 24	250	488¼	252, 343, 362, 335, 391
				Gowan of Sparrovale	6356	10 3 22	273	13½	6,588	4·81	317·05	200	361½	
				Myrtle of Sparrovale .	3905	20.3.22	273	5½	5,881	4·72	277·63	250	316½	236, 271
H. Gibson, Murraydale, near Swan Hill	Ayrshire	1	Nil											
R. Hall, Sale .	Ayrshire	1	1	Veronica of Dunachton	6389	29 12 21	273	16	5,453	3 90	212 74	175	242½	
Dr. and Mrs. E. J. Henderson, Wangaratta	Jersey	2	Nil											
W. Henderson, Grasmere	Ayrshire	3	1	Viola 2nd of Carrocoorte ..	9452	22 3 22	273	14½	4,744	4 36	206 95	175	236	

STANDARD HERD TEST—*continued.*

Owner.	Breed.	No. completed Test.	No. Certificated.	Name of Cow	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
S. A. Johnson, Woodend	Ayrshire	1	1	Bountiful of La Motte	5253	3 2.22	273	24½	8,119	4·34	352 42	250	401¾	389, 332, 313
A. W. Jones, Whittington, near Geelong	Jersey ..	5	5	Lady Grey 11th of St. Albans	9432	18.1.22	273	19	5,867	5.47	321·10	200	366½	341
				Butter Queen 2nd of Meryula	9736	18.1.22	273	18½	4,826	5·64	272 41	200	310½	292
				Blanchette 3rd . ..	3753	18.1.22	273	13½	6,515	5·52	359·61	250	410	296, 281, 397, 419, 346
				Mystery 22nd of Melrose .	8422	21.2.22	273	16	4,702	6·92	325·36	..	371	
				Beauty of St. Albans ..	..	26.3.22	273	19	5,878	5 61	329·79	175	376	
	Friesian	4	4	Waituki Princess Abagail .	1023	30.12 21	273	26½	9,000	3·39	305·41	200	348¼	272
				Cordyline Inka de Kol ..	..	28.1.22	273	30	10,153	3·94	400·81	200	457	282
				Bell of Craigneil	1031	15 2.22	273	20½	7,406	3·71	274·67	200	313	294
				St. Alban's May Queen ..	1036	19 3.22	273	25	7,864	3·50	275·19	175	313¾	
A. Joshua, Berwick	Jersey ..	1	1	Melba of Hillcrest . .	.	1 3 22	273	18½	4,732	4·67	221·06	175	252	
Kerr Bros., Bacchus Marsh	Shorthorn	2	2	Morven Pansy 8th . ..	.	2.3.22	273	16½	7,471	3·99	298·41	250	340¼	276
				Morven Pansy 7th ..		14.3.22	273	26	8,978	4·04	362·76	250	413½	360
A Kirby, Daylesford	Ayrshire	2	2	Cissie of Wattlebank .	9682	26.2.22	273	18½	5,893	4 28	251·96	175	287¼	
				Annie of Wattlebank ..	9681	1.3.22	273	20	5,954	4·46	265·28	175	302½	
P H. Lawrence, Agt s	Jersey ..	2	2	Little Queen	5249	22 1.22	273	14½	6,160	5 28	325·46	250	371	359, 366, 468, 376, 432
				Tilly Lantry 2nd of Warenda	7198	5.3.22	273	9	4,454	5.71	254·26	250	290	295, 262

STANDARD HERD TEST—*continued.*

Owner.	Breed	No. completed Test.	No. Certificated.	Name of Cow	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
C. Lees, Lockington	Ayrshire	2	2	Sunny 2nd of Gleneira	3453	8.1 22	263	4	5,685	4·67	265·44	250	302¾	
				Nestle of Gleneira . .	6149	4.2 22	273	19	7.518	4·51	339 24	250	386¾	
Mrs. E. M. Lennie, Tongala	Jersey . .	5	5	Sweet Nell of Hillcrest . .	6019	27 12 21	273	31	9,767	5.17	504.64	250	575¼	303
				Primrose 2nd of Bonshaw . .	7102	1 1 22	273	11½	5,099	5.43	276.88	250	315¾	346, 310
				*Tulip 5th of Bonshaw . .	7104	23 1 22	273	32½	8,148	4.49	365.95	250	417¼	237, 235
				†Tulip 4th of Bonshaw . .	7103	3 2 22	273	12½	5,875	4·89	287 47	250	327¾	338, 324
				Phyllis of Hillcrest . .	6014	26 3 22	273	18½	5,920	4 38	259 25	250	295½	
Leongatha High School, Leongatha	Jersey . .	2	2	Alice	. .	6.2.22	273	13½	4,895	5·98	292·53	250	333½	315, 308, 384
				Surprise	. .	23.3.22	273	19½	5,598	6.06	339·20	250	386¾	304, 253, 354
H. Luxton, Whittlesea	Jersey . .	4	4	Letetia 2nd of Somerville . .	9416	30.11.21	273	17½	6,534	5·15	336·19	250	383¼	
				Audrey's Victress of Somerville	9411	16.1.22	273	11½	4,381	5·40	236·69	200	269¾	242
				Trinket of Banyule . .	9512	19.1.22	273	17	5,182	5·31	275·43	175	314	
				Lady Grey 16th	. .	6.3.22	273	12½	4,079	5·88	239·88	175	273½	
C. G. Lyon and R. R. Kerr, Heidelberg	Jersey . .	4	4	Harp	5206	24.12.21	261‡	16½	5,234	5·35	279·90	250	319	288, 344, 460, 385
				Silvermine 20th of Banyule . .	7131	13.2.22	218§	21	6,232	5·67	354·54	250	404¼	371, 380
				Mezzo of Banyule . .	9496	23.2.22	273	10½	5,896	5·66	333·92	200	380¾	252
				Molly 4th of Banyule . .	4246	17.3.22	273	17	8,337	4·71	392·84	250	448	302, 393, 445, 422, 404
McFarlane Brothers, Bundoora	Ayrshire	5	4	Heather Belle of Ayrbrae . .	. .	3.1.22	258	4	6,108	4·02	245·53	200	279¾	281
				Lady of Ayrbrae	7562	11.1.22	273	8½	4,490	4·18	187·62	175	214	
				Lassie of Ayrbrae	6641	22.1.22	273	9½	6,223	3·78	235·37	200	268¼	242
				Bud of Ayrbrae	7561	26.3.22	273	12½	4,669	4·11	191·79	175	218¾	

* Tested for the two previous lactations as Tulip 2nd of Bonshaw. † Tested for one lactation as Tulip of Bonshaw ‡ Withdrawn before completing full term § Died before completing term

STANDARD HERD TEST—*continued.*

Owner.	Breed.	No. completed Test.	No. Certificated.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
W. J. McKernan, Byrnside, near Tatura	Ayrshire	2	2	Duchess of Locheden ..	5437	9.1.22	273	8½	5,605	4·41	247·19	200	281¾	211
				Jessie of Willowvale ..	4647	8.2.22	273	17	6,082	4·71	286·16	250	326¼	254, 338
T. Mesley, Dalyston	Jersey ..	1	1	La Charme .	5248	10 1.22	153*	28½	5,214	5·47	285·34	250	325¼	280, 438, 413,481
T. H. Payne, Kilmore	Red Poll	1	1	Woodburn Tartar . .	226AA	10.3.22	273	15	4,889	4·60	224 91	175	256½	
J. Phillips, Murraydale, near Swan Hill	Jersey ..	1	1	Carnation of Ferntree Vale ..	9637	26 12.21	273	16½	5,170	5·30	273 84	175	312¼	
F. Raggatt, Casterton	Jersey ..	3	3	Silvermine 3rd of Clover Flat	9646	18 3.22	273	13	4,787	4 76	227 81	200	259¾	252
				Queen's Princess of Clover Flat	7447	18.3.22	273	21	7,152	4·52	323·14	200	368¼	
				Princess of Strathbon	.	25.3.22	273	11	4,444	4·79	212·92	175	242¾	
J. D. Read, Springhurst	Jersey ..	9	9	Cosmos of Springhurst	Not yet allotted	5.3 22	273	15½	4,228	6·19	261·74	175	298½	
				Boree of Springhurst	,,	8.3.22	273	20½	5,673	4·92	279·25	175	318¼	
				Bouvardia of Springhurst	,,	13.3.22	273	20½	5,235	4·66	243·89	175	278	
				Forget-me-not of Springhurst	,,	26.3.22	273	13	4,159	6·25	259·77	175	296¼	
				Alskye 2nd of Springhurst	,,	17.3 22	273	17½	4,181	6·11	255·34	175	291	
				Fern of Springhurst	,,	19.3.22	273	18½	5,039	5·51	277·69	175	316½	
				Tulip 2nd of Springhurst		21.3 22	273	21	5,639	5 61	316·47	175	360¾	
				Chanthus of Springhurst .		25.3 22	273	15	4,288	6·13	262·96	175	299¾	
				Delphinium of Springhurst ..	,,	25.3.22	273	14	4,035	6·04	243·90	175	278	
Miss Bruce Reid, Bundoora	Jersey ..	6	1	Jubilee Red Rose ..	7346	23.1.22	273	22½	5,807	5.25	304·78	250	347½	298, 356

* Died before completing full term.

STANDARD HERD TEST—*continued.*

Owner.	Breed.	No. completed Test.	No. Certificated.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
C. J. Reid, Devenish	Jersey ..	1	Nil											
Miss S. L. Robinson, East Malvern	Jersey ..	2	1	Kyora's Detender's May 3rd..	7380	2.1.22	273	10	4,513	5·83	262·96	250	299¾	255, 212
J. H. Rogers, Yarraville	Ayrshire	1	1	Sadie of Burnside ..	2896	3 1 22	259*	10½	8,149	3·60	293·57	250	334¾	
G. Rowe, Kardella	Jersey ..	1	Nil											
S. Russell, Tongala	Friesian	1	1	Dimple of Craigneal .	1070	17.12.21	273	20	8,767	3·55	311·48	175	355	
F. G. Sadler, Camperdown	Shorthorn	1	Nil											
Sadler Brothers, Noorat	Ayrshire	2	2	Thelma of View Point .. Brilliant 2nd of Kilmarnock	4622 5850	7.1 22 27.3.22	262* 182*	15 17	7,983 5,149	3·88 4·32	309·76 222·56	250 200	353 253¾	299, 249 282
A. H. S. Schier, Kernot	Ayrshire	10	4	Daisy Brown of Inverleigh .. Zeta of Sunnyside .. .. Bettsie of Inverleigh .. Prudence of Roxburgh ..	7708 10324 10285 6331	2.1.21 1.2.22 5 2.22 11.2.22	273 273 273 273	15½ 14½ 13 25½	5,194 4,369 4,685 5,967	4·45 4·25 4·55 3·64	230·97 185·68 213·16 217·34	175 175 175 200	263¼ 216¾ 243 247¾	 186
O. J. Syme, Macedon	Friesian	1	1	Bolobek Frieda .. .	1116	17.3 22	273	27½	8,619	3.72	319.61	175	364¼	

* Withdrawn before completing full term

STANDARD HERD TEST—*continued.*

Owner.	Breed.	No. Completed Test.	No. Certificated.	Name of Cow	Herd Book No	Date of Calving	Days in Test	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
W. Tendeson, Merrigum	Jersey .	3	3	My Luck of Tarnpirr Lady Choice of Tarnpirr Guinea Gold of Brookside ..	.. 5160 9721	14 2.22 1 2.22 5 2.22	273 273 273	18 24 17	5,924 8,088 7,650	5·80 5 74 4·48	343·87 464·15 343 01	175 250 250	392 529¼ 391	494, 474, 376
J. H. Thorburn, Woodend North	Ayrshire	2	2	Oatland's Annie Oatland's Peg	6926 6930	23.1.22 11.2.22	273 273	20½ 14½	5,947 4,554	4·80 4·41	285 54 200·83	200 200	325¾ 229	
J T. Tweddle, Sunbury	Friesian	1	1	Lady Pirie		4 1.22	273	25	10,192	3 26	332·46	200	379	
G A Waite, Werribee	Friesian	3	3	Pauline 2nd of Ashby Halcote Ariadne .. Halcote Joan de Kol	700 535 578	19 1·22 10·2·22 28 2·22	273 273 273	24 15½ 17½	6,755 5 350 5,903	3·35 3 69 3 74	226 14 197 60 220 71	175 175 175	258 225¼ 251½	
A. L. Walters, Little River	Jersey ..	1	1	Bonnie 2nd of Tarnpirr	7052	24 1 22	273	16	5,778	6 70	386 87	250	441	
Warrnambool High School, Warrnambool	Ayrshire	2	Nil											
W. H. Waycotte, Seymour	Jersey	1	1	Lady Perfection	4555	7 3 22	273	23	7,216	5 88	423·99	250	483¼	222, 365
J. Wills, Bacchus Marsh	Friesian	2	2	Bolobek Joan Pomakaka Snowflake	315 1138	14 2.22 2.3.22	273 273	21 21	8,502 7,904	3·01 3·29	255·83 260·28	250 200	291¾ 296¾	196

STANDARD HERD TEST—*continued.*

Owner	Breed.	No. Completed Test.	No. Certificated.	Name of Cow	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs	
W. Woodmason, Murrumbeena	Jersey	10	10	Jenny Lind 9th of Melrose ..	5543	13.1.22	273	18½	6,414	6 17	395·91	250	451¼	347, 391, 397, 424, 417
				Lady Elector 7th of Melrose	9891	14.1.22	273	16	4,832	5 56	268 77	200	306½	
				Daisy 14th of Melrose	..	27.1 22	273	16	4,651	5·99	278·56	175	317½	
				Graceful Duchess 19th of Melrose	7540	8 2 22	273	22½	6,800	6·44	438·21	250	499½	325, 404
				Laura 9th of Melrose	5551	13.2 22	273	19	6,715	6 05	406·36	250	463¼	343, 392, 365, 434, 409
				Jessie 20th of Melrose	7541	21.2.22	273	18	6,087	6·22	378·33	250	431¼	310, 391, 397
				Handsome Girl 10th of Melrose	..	25.2.22	273	16½	4,925	6·05	297·74	175	339½	
				Lassie Fowler 7th of Melrose	7542	1.3 22	273	24	7,953	6·11	486·27	250	554¼	339, 368
				Edith 6th of Melrose	7539	6 3 22	273	20	7,187	5·99	430·44	250	490¾	333, 381
				Jessie 29th of Melrose ..	.	9.3.22	273	12	4,632	5·89	272 61	175	310¾	

PASSION FRUIT CULTURE IN VICTORIA.

(Continued from page 14.)

By J. Farrell, Orchard Supervisor.

VII.—Pruning.

In the past, little attention was given to pruning, but, from our present knowledge of the passion vine's requirements, its future scientific treatment in this respect, so that the best results may accrue from its cultivation, should be regarded as essential. The type of vine most amenable to pruning treatment is that illustrated in Fig. 6, Section A, but less favoured types are often improved by the same process. In pruning the young vine so that the required number of leaders may be obtained, the stronger branches should be cut back or suppressed, so as to flush the sap to the "crown" buds, with which the plant is usually abundantly supplied. By the proper manipulation of the growths from those buds, the fan or framework of the vine may be perfected as already described.

The passion vine being a gross feeder, grows rapidly; therefore, during its development as well as afterwards, the soil should be kept well worked, and liberally manured where necessary. Many passion plots have been slow in coming into full bearing because of the neglect of these essentials in their cultural management. The vine begins to produce fruit when two years old, but this does not retard its growth provided thorough soil cultivation be practised; in fact, precocious vines are preferable. Pruning during the first three or four years consists mainly in regulating and directing the leaders which afterwards produce numerous superfluous light laterals. If these be not removed at the pruning, their subsequent maintenance causes the plant to become somewhat devitalized, and consequently more easily defoliated by disease and frosts, particularly when cultivation, &c., is neglected. With proper care and attention the vine usually reaches its maximum of fruitfulness when about six years old, and the retention of the debilitated willowy growths appearing after that time especially causes the feeding roots to become sluggish and to eventually cease functioning. Then the death of the plant, from what was formerly regarded by most growers as the effect of some mysterious cause, ensues. The passion being an exotic, however, probably suffers also from other yet unknown disabilites. A much higher percentage of vines died in former years, in the manner explained, when pruning was omitted, than during recent times when pruning has been more generally practised, other conditions being equal. It is, consequently, generally conceded that in future pruning must be regarded as a prime factor in passion-growing.

Reducing the superstructure of a reasonably healthy vine by removing the numerous useless lateral growths stimulates root action, and the sap is flushed to the several selected points of vantage. A smaller number of laterals appear during the next period of growth, but, although less numerous, the fruits produced on these are invariably more luscious and of finer quality than those of an unpruned vine.

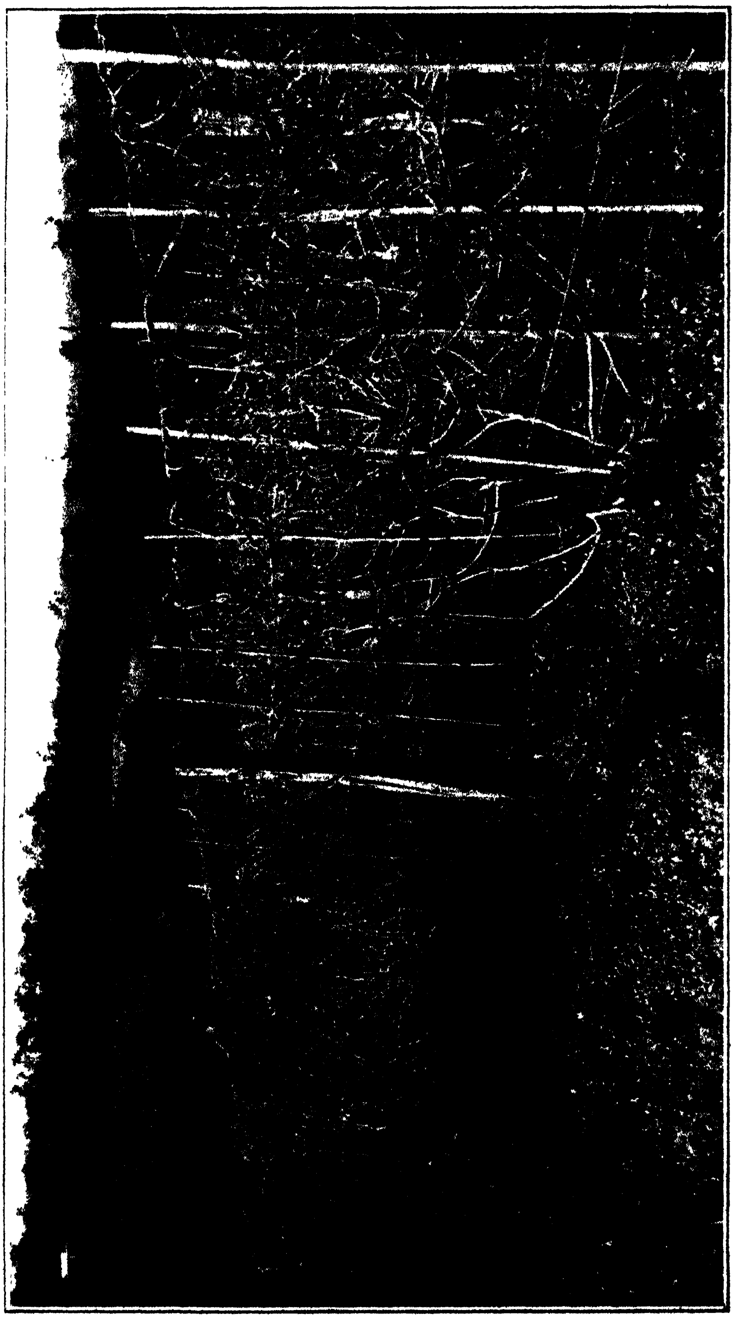


Fig. 11.—Trellis of passion vines showing method of pruning.

It should be generally understood that the passion, like the grape vine (*Vitis*), develops its fruit on the succulent laterals produced during the currency of the same season's growth, and that these laterals mostly come from leaf-buds on the previous year's wood. Most of the growers in the passion fruit districts, owing to their rather limited experience with the grape vine, are not thoroughly acquainted with its pruning needs, and are, therefore, somewhat slow in gaining a knowledge of the passion, which requires somewhat similar treatment in this regard.

During normal seasons and in suitable position, the matured foliage assists materially in protecting the leader wood and fruiting laterals from frost during winter; pruning, therefore, should not be commenced until the frosts are over. Fig. 11 shows a trellis of five vines eight years old, the one in the right of the picture pruned and the four on the other portion of the trellis unpruned.

The visitation of *gloeosporium*, in a most virulent form, which immediately followed the heavy rains experienced in February last year, destroyed a high percentage of the first crop then ripening, and caused the vines to become sparsely foliaged. The plants were unable to regain their normal condition during the remainder of the growing period, which was followed by unusually severe frosts and a heavy fall of snow. These cold conditions supervening on the *gloeosporium* effects were responsible for the almost complete defoliation of the vines in the different districts, the condition of the plants shown in the picture (Fig. 11) being typical of most of the passion plots. The winter of 1922 is now regarded as the most severe in the history of passion fruit culture in Victoria. There is no reason, however, for intending planters or others inexperienced in passion-growing to become dismayed, because severe winters are of rare occurrence, and even when badly "frosted" the vines, if carefully tended afterwards, quickly recouperate when the spring growth commences. The photograph, of which Fig. 11 is a reproduction, was taken in Mr. Maynard's orchard at Silvan on 12th October, 1922, and later on when these vines are in full foliage they will be again protographed and the reproduction made available for comparison with the illustration under review.

Prior to being treated, the pruned vine appearing in the illustration was covered with a dense mass of light willowy growths like those on the untreated ones on the other end of the trellis. Some of the twigs had been killed by frost, while others were still alive but without leaves. In pruning the established vine, all the sickly or dead laterals are severed, at or near their base, from the main branches and sub-leaders. This is to flush the sap to the basal buds so that they may give out shoots, which, during their period of growth and development, yield the fruit for that season. The healthier laterals may be shortened back or removed in like manner, according to the condition of their buds and that of those at the base; but, generally speaking, practically the whole of the laterals may be removed. Dead or diseased leaders should also be cut out and suitably placed young growths made to take up their places. The main arms as well as the smaller growths sometimes become badly "frosted" during severe winters and often even in mild winters when the vines are grown in unfavorable situations. When it is plain that a plant suffering in this way or affected by fungi will have great difficulty in recovering, the best remedy is, when pruning, to cut all the leaders off at the crown. Then the latent crown buds will yield an ample supply of young growths with which a new fan may be constructed.

When pruning the vine was first adopted a long hook-shaped knife, or sometimes a hedge shears was employed to get over the work quickly, the mass of laterals being practically shorn off. Through knowledge gained by practical experience, however, the use of those implements has been abandoned in favour of the ordinary secateurs by which, though pruning becomes a slower process, the growths may be cut back more accurately and neatly to the desired nodes and bases. Apart from the advantages derived from treating vines in the manner explained, it may be further stated that pruning, to a great extent also, regulates the time of cropping. Unpruned vines blossom early and mature the first or heavy crop of the season, sometimes causing a glut and relatively low prices; whereas, pruned plants yield a later crop when higher prices are obtainable.

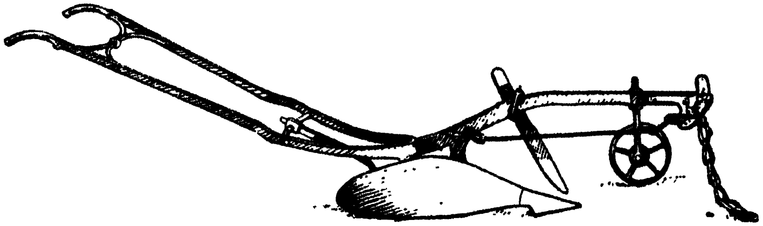


Fig. 12.—Single-furrow orchard plough of modern type.

VIII.—Soil Management.

The amount of cultivation needed by passion plots so that the best results may be obtained from same depends largely on the nature of the land and the weather conditions prevailing locally. Two ploughings a year are usually sufficient to keep the soil in a sufficiently loose state to enable cultivators and harrows to maintain its satisfactory condition of tilth. One ploughing to 6 or 8 inches deep, according to the depth of the surface soil, should be given as soon as possible after the first autumn rain. On this occasion the soil should be drawn towards the rows of vines on both sides, so that the furrows formed between the trellises and running with the fall of the land may carry away the surface water during winter. Where the soil is heavy and tenacious, it should not be further broken up by harrows but allowed to remain in the rough state to become aerated and pulverized by the influence of winter weather conditions. When with the arrival of spring the desired alteration in the soil has taken place and the land becomes sufficiently dry, it should be harrowed down prior to being ploughed again. On this occasion the furrow depressions should be filled in by drawing the soil away from the vines, thus restoring the level surface which existed prior to the autumn ploughing. The type of single-furrow plough, illustrated in Fig. 12, and mostly used in the orchards for ploughing near the trees to obviate digging the strips, has proved the most suitable for employment on the passion plot. Its shifting handles and adjustable head-rack facilitate the working of the soil around the butts of the vines when ploughing either on or off.

No time should be lost after the spring ploughing in bringing the soil into a fine state of tilth to conserve the soil moisture for the vines during summer, as the more suitable passion soils part with their moisture quickly except intensive cultural measures are taken. For this work a nine-tine spring-tooth cultivator of the type shown in Fig. 13 is the most suitable implement, being preferable to the ordinary drag-harrow and disc cultivator. Here the cultivator is shown as running on the skid, but by the handle and rack adjustments the teeth may be lowered to work at the desired depth. The "spring-tooth" should be frequently used during summer and particularly after rains or irrigation. It often happens, however, that owing to pressure of work or lack of the necessary assistance, cultivation after rains has to be omitted; then the use of the disc cultivator becomes imperative.

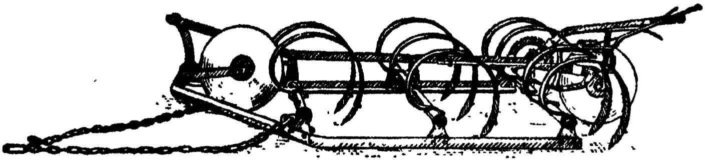


Fig. 13.—**One-horse spring-tooth cultivator.**

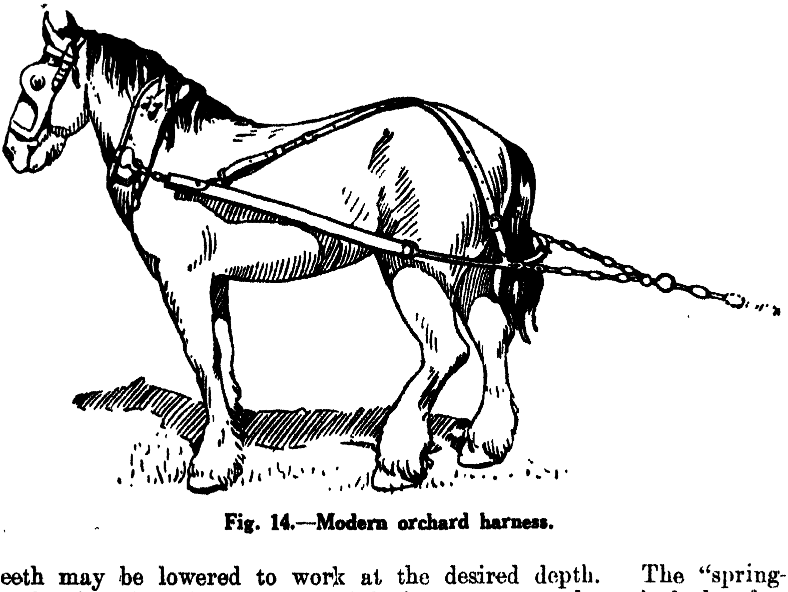


Fig. 14.—**Modern orchard harness.**

Some of the more friable, red soils lend themselves to intensive cultural treatment even during winter, and when fairly rich and in nicely-sheltered warm positions, the passion shows its appreciation of these. This feature is more noticeable when the vines are growing on virgin soil than on previously cultivated land.

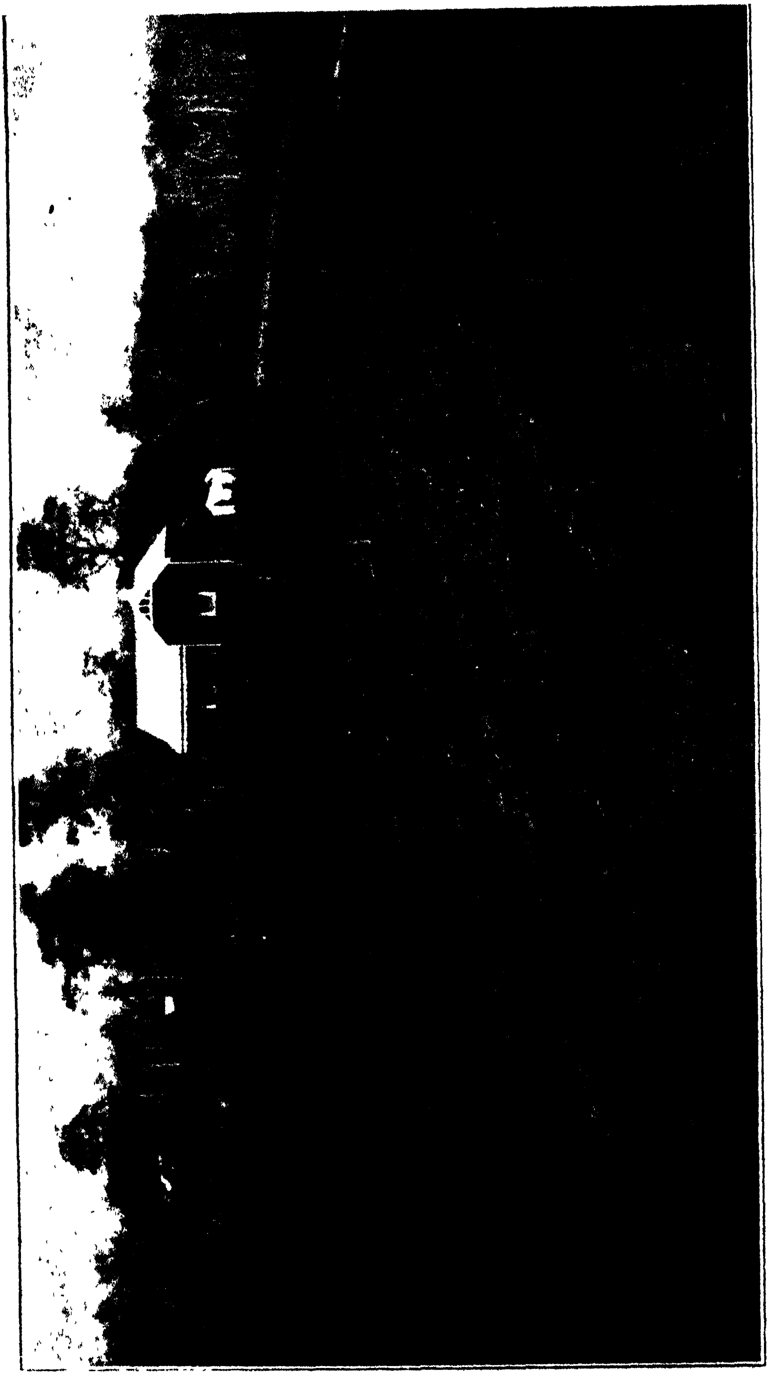


Fig. 15.—Planting passions among the strawberries.

When ploughing and cultivating, great care should be exercised not to damage the bark of the stems or branches of the vines with the implements, as the spores of fungi often find a lodgment in the wounded parts, sometimes causing the death of the plants. There are no cultivated orchard plants more easily injured than passion vines. They often suffer considerable damage by having branches broken and portions of the bark removed from their stems by the projecting ends of the old-fashioned swingle-bars and long trace chains still used by some growers. The chances of injury to the vines may be reduced to a minimum, however, by employing orchard harness of the type appearing in Fig. 14. This is a relatively light harness, and the iron tube forming the bow, which takes the place of the objectionable swingle-bar, is held up by leather hip-straps, and the traces, being of leather also, there is no rough surface to come into contact with the vines. As the draught is adjustable from straight behind the horse when ploughing on or off, the bow does not chafe his legs.

Fig. 16.—Planting lemons among the passions.

The fact that the passion vine being a greedy feeder invariably responds well to good cultivation cannot be too frequently emphasized, as this phase of its culture is so often neglected. It should also be remembered that, as one-way working is imperative (cross-cultivation being precluded by the wires), and as the vine is an evergreen, the soil should be at all seasons of the year kept in as perfect a state of cultivation as local conditions will permit. The vines, when left to their own resources or treated to shallow cultivation, become surface-rooted, producing a high percentage of their roots in the surface soil. Deep working, from 6 to 8 inches, according to the depth of the surface soil, so necessary for the passion plot, counteracts this objectionable condition, and trains the roots to function below the reach of cultivating implements. No crops of any kind, particularly cereals and cabbage, however well tended, should be grown among the vines. Not only do these crops deplete the soil of the vines' essential food, but they also monopolize the air spaces between the trellises to the detriment of the passions. Although this practice has demonstrated many undesirable results, there are growers who still persist in it, but there is evidence of its future discontinuance.

Old strawberry patches, as soon as the bushes cease to produce remunerative crops, are sometimes planted with passions. Fig. 15 shows Mr. Waring's passion plot at Silvan being extended in this manner. When the strawberries begin to "go off," the yearling vines are planted out and tied to stakes, as shown in the illustration, and usually the following year the trellises are erected. When the strawberries lose their commercial value they are ploughed in, and the land utilized solely for the passions. Likewise, when passions cease to yield payable crops through old age or other uncurable causes, they also are interplanted with other fruits. Fig. 16 shows this condition of affairs in Mr. R. Bowman's orchard at Silvan. Here rows of lemon trees are planted between the trellises, and the vines are being gradually removed. The arrow indicates the position from which one trellis has been taken The land is good, and there is every indication of the citrus doing well.

(To be continued.)

THE MARKET FOR PASSION FRUIT PULP.

Passion fruit pulp is a commodity for which there seems to be a growing demand, both in America and London. A considerable quantity of pulp was sent to America last year—about £10,000 worth. This was forwarded in wooden casks, a certain proportion of sugar being added and the whole shipped at a low temperature direct. The price paid by the purchaser, it is understood, varied according to the quality from 1s. 3d. to 9d. per pound, and as 2½ lb. of passion fruit will make a pint of pulp the prices may be considered satisfactory.

The New South Wales Department of Agriculture has carried out a considerable amount of work in connexion with the best method of putting up the pulp, the method favoured being to pulp in cans and subject these to a heating process. It has been ascertained that to bring the pulp to a temperature of 190 degrees Fah. in a period of twenty minutes results in a very excellent article; but there is every reason to believe that the temperature can be reduced without any lengthening of the time, and further investigations under this and other headings are at present in progress.—*Agricultural Gazette* of New South Wales, December, 1922.

SUCCESSFUL DAIRY FARMING.

WHAT DOES IT MEAN?

By J. M. Kerr, Herd Registrar, Department of Agriculture.

The Attributes Required for Success.

It is only too true that popular opinion is prepared to count a dairy-farmer prosperous on no other evidence than that he pays his bills and is in occupation of a farm. The fact that men are dairymen only because they are willing to work unscheduled hours and may deny themselves more holidays than other workers is either overlooked altogether or is not regarded as affecting the question. A business cannot be held to be lucrative, or even remunerative, in which a man meets his liabilities only by working inordinate hours, or by foregoing the ordinary comforts of life which are the common lot in other callings equally open to him. Nor can one be said to be paying his way who finds it necessary to impose on special relationships for cheap labour services—a condition of affairs still common among dairy-farmers with families.

Many, mostly city people, cast longing eyes at the life on the land because they have noticed so many probate notices of farmers' wills running into four figures. It just shows how crudely opinions are arrived at; the amount of capital originally invested or the number of generations which might have been engaged are not regarded as material. No conclusion worth while can be come to unless a dairy-farm is considered as any other kind of business and the same tests applied. What, then, are the requirements with which a dairy-farm must comply before it may be deemed a successful business? The first cost which it must meet is interest at the current rate on the whole capital value of land, stock, and plant (for had the farmer merely lent this sum out in a gilt-edge security, he could obtain full interest without any labour). It must also return annually an additional sum equivalent to the yearly depreciation of buildings, fences, plant, and stock. Further, it must return a sum to meet all incidental expenses, including a proper wage to every hand engaged. Then the surplus by which the gross income exceeds the total of all this is what the farmer himself is receiving for risks, his managing ability, and his labour.

The dishonest farmer might be tempted to make his own salary a first claim on the revenue, enjoy himself, and put off his just liabilities as long as he is permitted, which is not likely to be very long. But all except an insignificant minority of farmers first pay all their just debts, recognising that only what is over is theirs by right. It might be only a bare three meals a day and a bed to lie on, or it might be a sum approaching the earnings of a farm produce merchant according to the qualifications of the man himself for the calling. There are hundreds of farmers, with all the necessary physical attributes, accepting half the wage now paid to hod-carriers and delivery carters. But such men certainly lack the initiative either to improve their methods or seek other fields, and their lot excites little public interest. The fact that there are dairy-farmers of the first generation whose farms return them a good salary over all expenses shows that the opportunity is there for the right men, *i.e.*, the man with the qualifications.

Dairying is not, like the hod-carrier's, an unskilled occupation, but requires certain human attributes leaning as much to brain as muscle. In this regard dairying is, perhaps, the most complete form of agriculture, and also the most exacting. There need be no slack time such as there is in merely growing wheat or fruit. Even the Sabbath offers but little respite. It is hard indeed if, at the end of each year, a dairyman finds himself worse off financially than if he had been hod-carrying. Although it cannot be claimed that dairying is necessarily more remunerative than other branches of agriculture, considering the nature of the work it involves, it can most assuredly be claimed that it is safer. Its returns come early and at frequent intervals, each return eliminating some of the year's risk, thus commanding more credit for the owner. Its appeal is, consequently, more to the struggling than to the strongly-established land-owner. Entailing, as it does, more labour for a given return than other rural pursuits, the dairying industry feels more the general labourer's growing aversion to country occupations; but despite this relative disadvantage under which it has to labour, the man to whom it is congenial can make it at least as remunerative as any other agricultural vocation. It is not a life which every one would find congenial; in fact, it might be well to say at the outset that it is only the man of exceptional grit who wins eminent success at dairy-farming. If the successful dairy-farmer is not a type in himself, there are very many types which could never include him. Most men possessing a business sense, such as the progressive dairyman must have, are disinclined for the manual labour and seven-days-a-week attention which the calling involves. Be he ever so hard-headed and shrewedly-calculating, the beginner is not likely to enjoy much profit apart from his own pair of hands and rolled-up sleeves. Likewise, be he ever so industrious, he will soon find that the mere performance of work helps him little if it is not the right thing that is done. The attributes most likely to win success in dairy-farming are the same as make for commercial success everywhere, viz., zeal, industriousness, and business sagacity.

The dairy-farmer *par excellence* is he who, while lacking neither, possesses the first in sufficient measure to find all the recreation he seeks in some useful activity on the farm—that is, recreation in his vocation, or the delight of one's true calling. This is the particularly successful man occasionally pointed to as proof of "money in dairying." Such cases, of course, do not prove that dairying is lucrative for the mass any more than the more common failures prove that it is unprofitable. The human factor is all important. Enthusiasm is to be welcomed, but the enthusiasm of ignorance is not sufficient. It too often fizzles out when the real work is encountered.

Not every man who imagined that a bit of land and a few cows would "make him" for life finds it so when the opportunity has occurred. The glowing picture so commonly painted of the dairyman's life amounts to misrepresentation, which often serves to lead either mere hard-workers or comparative drones to attempt a life suitable only for men better furnished by nature. No man is safe in committing himself to the responsibility of a dairy-farm until he has first actually engaged in its exacting duties for a period sufficient to test his mettle. Among the city born, the popular conception of the life is so different from the real thing that general advice to take it up cannot safely be indulged in. A period of probation, preferably as an employee, is a wise safeguard against disillusionment occurring when it is altogether too costly. Only by actual experience can a man prove the permanence or otherwise of the appeal the life—with its somewhat long hours, seven days a week, paid for by results—is making to him.

If the predilection survives this test, one great essential—zeal—is proved. With zeal, industriousness can generally be assumed, and these two together will insure that possessed intelligence will be applied. If possessed in sufficient degree the natural intelligence, or business sagacity may be calculated to protect him from the serious initial blunder of either buying too much or overpaying for his land; it will cause him to appreciate the value of efficiency in his every implement and animal to fulfil the purpose for which it is kept, especially the animals constituting his dairy herd; it will enable him to see the importance of seizing every opportunity, as it occurs, of furthering the operations of the farm, especially in the direction of providing economically an unfailing supply of fodder for his cows; it will teach him to recognise that money judiciously expended for soil repletion and on concentrates for his cows is "sprat" which catches the "mackerel"; it will prevent his failing to note the important bearing quality has on the selling price of his product; it will bring him early to learn that the only portion of the return from his cows which accrues to him is that which is surplus over feeding and labour costs; and it will not only help him to know all these and other facts innumerable, but it will make him wise enough to act upon them all. The wise farmer is generally a reader, and, by thus helping himself to the experiences of fellow farmers the wide world over, becomes so much better fitted to get the best out of his occupation.

The Amount of Capital Required.

It is, perhaps, needless to point out that to become a master dairyman some initial capital is indispensable. It is safe to say that success can be out of sacrifice only, if this be inadequate. With prices of all thing, as at present, in a state of flux it is impossible to say more than approximately what sum constitutes "adequate capital." Whatever sum is arrived at as being necessary would, in these times, be best regarded as the minimum. The first step is to try to estimate what sum will have to be paid for the land. Reasoning in the following way an approximation may be attained to. The acreage which will grow sufficient pasture to permanently provide body-maintenance of one average-sized bullock is worth at present produce values about £100 (providing it possesses reasonable marketing facilities); so that by dividing into 100 the acreage of grass land which will furnish a beast throughout the year something like the acre-value of the land can be arrived at. Thus, if it takes 2 acres of grass for each beast, the land is worth £50 per acre; if 4, £25; if 5, £20; and so on up to 8 acres per beast, beyond which it is no use continuing the method, because land of lower quality than 8 acres to the beast is next to hopeless for commercial dairying. When the value of the total area has been thus arrived at, add on to it the utility value of existing dwelling, farm steading, and fences; or, in other words, all necessary improvements which contribute nothing to the land. The resulting sum will represent a safe price to pay for the farm, providing the purchaser has a certain cash or free credit fund of his own—the "adequate capital" previously mentioned.

The proportion this fund should bear to the whole liability is the next question. To illustrate, let us for simplicity sake take the minimum outlay likely to give a reasonable income to a man with average family obligations. Twelve cows is as many as one man can efficiently attend to, and we ought to be able to assume that what keeps a man fully occupied will also provide him with a fitting living. Now, on the basis above described it would take £1,200 worth of land to graze twelve cows, but that number of cows would permit time for cultivation, and as cultivation may generally be calculated to treble the carrying capacity of the portion so treated, the carrying capacity of the farm can be doubled so that half the area, or £600 worth of land, would suffice for the whole herd of twelve, with bull, horse, and a few young stock in addition. (This assumes that the owner will devote at least half the land to fodder crops, a proportion quite practicable on small farms.) No seller is likely to value even commonplace dwelling, steading, and subdivision fences at less than £500, which increases the sum to £1,100. The purchase of twelve good cows and a bull would account for about £200 more, making a total, so far, of £1,300. Horse, implements, and utensils are yet to be allowed for, so that the total capital value would easily amount to £1,500, which sum may be regarded as the minimum liability which the most humble dairy-farmer must incur in purchasing a farm. Now, cash being the only satisfactory payment for stock and plant, £400 would be required straightway for herd, horse, and plant. On the £1,100, which the farm is worth, he may be able to borrow anything from one-half to two-thirds, according to who the lender may be. Even if he is lucky enough to get a loan of two-thirds he still has to put up £366 of his own which, added to the £400 stock and plant cost, makes £766 the cash sum likely to be needed to successfully start a one-man dairy farm of twelve milking cows.

To show what average return per cow would be required to make such a farm "pay" the annual costs have first to be considered. Firstly, the land liability is £600. Those buildings among the steading which are particularly for dairying purposes would represent £200 of the building value allowed. There is £400 allowed towards horse, herd, and working plant, while debts incurred are those for seed grain, fertilizer, twine, freight, blacksmith's, saddler's, and other incidental charges which might be covered by £24 per year. Thus the sum locked up in land, dairy steading, stock, and plant (the value of the dwelling-house is omitted because man has a dwelling whether farming or not) is £1,200. This at 6 per cent. amounts to £72 or a first charge against each cow of £6 per year. Each cow must bear also her share of the £24 annual expenditure incidental to dairying operations—another £2. On most farms each animal will require £5 spent in purchasing concentrates for her proper feeding. Apart from labour the annual cost of each dairy cow is thus £13. The difference between this £13 and the value of her gross production in the year, the farmer may regard as his wages per cow. A most indifferent labourer on a dairy farm to-day can command 35s. per week and his keep—equivalent to a salary of £130 per year; and as twelve cows would fully occupy him the rate of pay is nearly £11 per cow. If a farmer who has purchased right can obtain this amount per cow over the £13 for her keep (£24 gross), he is being rewarded on the same scale as a farm labourer. If he has no better qualifications than a farm labourer he is not being very much underpaid, but it is on his own intelligence, industriousness, and zeal that he must depend to better the relationship which his income per cow bears to the above sum (which represents a yield of, say, 260 lbs. butter fat and 585 gallons of skim milk). It takes fairly efficient management to get even this average return in a herd of cows, but, as there are in our own State of Victoria some cows giving over 600 lbs. of butter fat in the year, many which give over 500 lbs., and whole herds which exceed 400 lbs., the farmer is commercially blind who cannot see the easier avenue which selective breeding offers.

[The list of items in the above statement of revenue and expenditure does not include either the stock depreciation or the increase of progeny, because they are likely to about balance one another; both have been omitted for the purpose of simplification. Depreciation of plant is likewise likely to be fully covered by the enhancement a good cultivating farmer is able to effect by proper utilization of the manure from well-fed animals.]

The Class of Land for Dairying.

Success at dairy-farming being finally measured by the extent to which a man is able to make the returns exceed the cost of production, it is well not to make the initial mistake of selecting an unsuitable farm on which all one's earnings are absorbed in attempting to remedy the defects of nature.

Water on the Farm.

By nature the dairy cow is designed to consume large quantities of herbage, not merely nutritious, but succulent as well. There is more virtue in the greenness of vegetable fodder than has yet been discovered or realized. Where the greatest continuity of such fodder exists, there is the natural habitat of the species, and the more nearly the location conforms to these, her natural conditions, the more efficiently will the milking mechanism function. Such conditions constitute what is commonly called "dairying country," and cannot exist naturally apart from a copious rainfall, to be valued not so much by the number of inches as by its timeliness. In fact, all that portion of our farming land which is not popular for dairying is just so because it is either not sufficiently favoured with rain in the warm months—a condition which makes for lusciousness of pasture—or else its soil is of a nature unsuitable for retaining moisture. Not only is the quantity of the cow's output dependent on water, but the quality of the marketed product can never reach the high standard set by our competitors without a liberal use of water twice a day on the dairy utensils. Farm animals require a never-failing supply for drinking purposes and the more tempting and conveniently available the better. One is fortunate if there be a running stream for the herd; if there is not, steps must be taken to provide a supply against all likely emergencies. Whatever the cost, neglect is likely to be more costly. If dams have to be resorted to the animals should not have direct access, but the water should be fed into troughs for them—even if a windmill be necessary. It is possible in many localities to strike a suitable supply for drinking purposes by a bore or deep well, from which the water may be cheaply raised by wind power. Such a supply is none the worse for the animals by being slightly brackish. The domestic supply is best conserved in tanks supplied from the roof, preferably underground, for it is certainly a boon on a dairy farm to have a supply, both fresh and cool, at one's command.

There is no need to tell the milker of cows that milk production is a continuous process, but all do not seem to realize that there must be equal continuity of food supply. The cow's udder cannot work apart from her stomach, and as frequently as the produce is removed from the udder, so must the latter be replenished through the stomach.

Cultivation and Continuity of Food Supply.

Pasture is sufficient for this only temporarily, and it is but for a short period in each year that even the best pastures supply a good dairy cow with as much raw material as her system is capable of treating. If the best of land is short-coming in respect of milk-making food, how much more necessary will supplementary fodder be on land of poorer quality. It may be accepted as an axiom that on any farm where conservation of fodder is not practised the cows carried are either too poor or too few, and it may be taken as another axiom that every dairy farm so managed is proving a poor investment to its owner. Continuity of food supply is a present-day obligation. It can be assured on most farms only by cultivation, and the great virtue of which is that it enables one to do with less land, thus cutting down the initial outlay necessary. The area of land required for cultivation should not be deduced from the number of animals kept, but rather the number of stock should be subject to the area one is able to cultivate.

The answer to the question "How much should a dairy-farmer cultivate?" is "All that is practicable." But there is no virtue in increasing the area if it means poorer tillage. It is not good practice to stock up to such an extent that each year's fodder production is consumed in that year, neither is it wise either to relax one's efforts or to increase the herd just because, as the result of a particularly bounteous season, there happens to be an extra surplus of fodder on hand.

A year's food supply in reserve is never out of place; in fact, no owner of a herd is quite secure with less. It is for this reason that a silo is so valuable. A little light land on a farm may not matter much, but an undue proportion of poor land should never be purchased as a dairying proposition. Present-day costs prohibit its being improved sufficiently to meet the exacting needs of milking cows, which must obtain their full food requirements without excessive travelling; nor does it give either dry springing cows or young growing heifers justice.

It has been shown that, by a sound policy of cultivation and conservation, the area of land which will support the minimum number of cows necessary for a man's living can be considerably reduced. This means less initial outlay, thus increasing the annual profits to the extent of the sum saved in interest.

As land values are based on prospective profits, the dairyman who, after paying the current price for his farm, will not cultivate, need not be surprised if his uncultivated farm proves a poor business investment. It is the beginner with little capital who can least afford to neglect the only possibility of keeping the herd's yield up towards the maximum. Dairying is difficult enough with well-fed animals; with semi-starved ones it is hopeless.

There is no cheaper way of buying the roughage which dairy cows must have, than by good tillage with farm-yard manure, and superphosphate, if applied to the right class of land. Hence the necessity, in the first place, of ploughable land of a nature to hold out well against intermittent dry spells which can be expected even in the wettest districts.

Light-coloured shallow soils are not reliable crop-growers, even though mineral fertilizer be applied; they require a longer growing period, which means greater risk. Good crops are only possible on such soils with either early autumn or late spring rains—preferably both—a condition of affairs only occasionally granted. Lacking vegetable matter or humus in their composition, they set closely under rain and, consequently, bake quickly in its absence even in the warmth of spring. The summer sun sets them hard and the early seeding which, in their case, is so necessary is practicable only by fallow, which is "time off," and, consequently, relatively costly. As so much depends on food supply in dairying, the beginner would do well to leave land of this class to the orchardist or any one else who does not need to count the cost. Almost as disappointing is some of our light chocolate land possessing no water-holding sub-soil. They are invariably situated in localities of high rainfall, and are generally deficient in nitrogen, which is leeched out, in solution, through the porous sub-soil by the heavy rainfall as quickly as it assumes the essential nitrate form. The best land has, of course, already been taken up, and there is now but little possibility of acquiring a property possessing all the features which best adapt it for the dairy cow. In fact, to get land right in quality one must not be too insistent on the other natural advantages. Lack of natural shelter is a disadvantage, but it is a minor objection only, provided the quality of the land is suitable. Much of our best dairying land is exposed and somewhat bleak, but it is found that this is not too severe a handicap if its quality enables one to alleviate it by producing plenteous feed. Some reduction should, however, be made in the purchase price to permit the buyer mitigating the defect by planting shelter belts. In purchasing land for dairying, its marketing facilities must be considered, and although there are but few districts now from which produce cannot be conveniently marketed, any increased cost of marketing must detract to some extent from the value of the farm, and should be considered when purchasing.

(*To be continued.*)

EXPERIMENTS IN THE STORAGE OF FRUITS.

(By D. B. Adam, B. Agr. Sc., Department of Agriculture.)

In order to test the keeping qualities of different varieties of fruit grown under varying conditions, eight experimental chambers were built into one of the commercial chambers at the Government Cool Stores, Victoria Dock, Melbourne. These chambers were placed four on each side of a central passage occupying in all, approximately, 864 square feet of floor space, and were of the dimensions set out in Table I. following:—

Table I.—Dimensions of Experimental Chambers.

—	Between Side Pipings.	From Passage Wall to Back Piping.	From Floor to Bottom of Air Ducts.
	ft. in.	ft. in.	ft. in.
No. 1 ..	8 9	9 6	6 6
2 .	9 0	9 6	6 6
3 .	9 0	9 6	6 6
4 ..	9 3	10 0	6 6
5 .	8 9	9 6	6 6
6	9 0	9 6	6 6
7 .	9 0	9 6	6 6
8 . ..	9 3	10 0	6 6

Passage ground floor, 36 inch x 4 inch.

Three chambers are fitted for the direct expansion system. This system requires coils of pipes arranged to a height of 6 feet along three walls. Through these pipes ammonia passes in expansion. Two chambers are fitted for the Circulating Air system. Cold air from the battery is driven into the chamber from a duct at the top of the chamber on one side. On the top of the other side of the chamber is a suction duct where the air is drawn off again. The amount of air passing in, and therefore the temperature, may be regulated by the use of two hinged-trap doors on the side of the inlet duct. Three chambers are fitted with a combination of the Direct Expansion and the Circulating Air system. Thus, there are two different systems of refrigeration under review—the Direct Expansion system, the Circulating Air system, as well as a combination of the two systems. The valves for the expansion pipes are situated in the passage; there they can be regulated to suit the varying adjustments necessary to maintain an even temperature.

The walls of the newly-built portion are insulated with buzzer shavings; that of the original chamber is insulated with pumice. This wall remains as the back wall of chambers 5, 6, 7, and 8, and the side wall of chambers 4 and 8, the passage wall to be regarded as the front of each chamber.

In regard to the experiments under review, three standards of temperature have been maintained, viz.:—32° F., 34° F., 37° F.

Of the three Direct Expansion system chambers mentioned above, one was maintained at 32° F., one at 34° F., and the other at 37° F.

With the Circulating Air system, one chamber was maintained at 34° F. and the other at 37° F. Again, of the three chambers with a combination of the two systems, one was maintained at 32° F., one at 34° F., and the other at 37° F. Temperatures were logged at hourly intervals right throughout the experiment by the engineering staff. The temperature of each chamber was taken by means of the Cambridge long-distance thermometer, which instrument is commercially recognised and used. The readings of the instrument were calibrated from a standard thermometer hung in the centre of the room about two feet from the bottom of the air ducts running along the ceiling.

The resistance of the "leads" may be varied so that the reading of the instrument in the engine room corresponds to that of the standard thermometer. A frequent check on the Cambridge thermometer was kept by the use of ordinary thermometers suspended in the room. Once properly calibrated, however, it gave reliable readings. The resistance coil was actually placed on the wall next to the passage and guarded by a shield, about and through which air could readily circulate. The chambers being small, the presence of a person in the room for even two minutes has a decided effect on the temperature, which, however, soon gets back to normal after the person's exit.

HUMIDITY.

Humidity has been determined by the use of a sling psychrometer. This consists of a wet and dry bulb thermometer, mounted so that it may be whirled. The wet bulb thermometer is covered with a piece of silk, which is wetted prior to being whirled for twenty seconds, when readings of the two are taken. The process of whirling is continued until consistent consecutive readings are obtained.

TABLE II.—SHOWING SOME TYPICAL READINGS OF PSYCHROMETER.

	Temperature.	Refrigerating System.	Percentage Relative Humidity.			
			1	2.	3.	Average.
Chamber 1	32° F.	D.E. and A.C.	90	89	90	90
2	32° F.	D. Ex.	85	87	88	87
3	34° F.	D. Ex.	85	83	90	86
4 .. .	34° F.	A.C.	90	80	85	85
5 .. .	34° F.	D.E. and A.C.	90	70	85	82
6	37° F.	D.E. and A.C.	81	72	81	78
7	37° F.	D.E.	81	73	80	78
8	37° F.	A.C.	86	74	75	78

Examination of this table shows that the percentage of relative humidity is lower in the chambers maintained at the higher temperatures, but there is no significant difference as regards the different systems of refrigeration.

The keeping quality of fruit is dependent on a wide variety of conditions—the conditions of growth in the orchard; the degree of maturity at the time of picking; the methods of handling, packing, of forwarding, and placing in store (including the time occupied in these operations); finally, the conditions in the cool store as to temperature, methods of cooling, &c., have their influence. A variety of fruits have been used in the course of the experiment.

An analysis of the conditions under which losses occurred, together with their probable causes, has been attempted. It is by consideration of, and deduction from such analyses that the best methods of picking, packing, and storing will probably be evolved.

EXPERIMENTS WITH PEARS.

Losses in the storage of fruit may be broadly divided into two main classes—(1) Physiological changes, which include abnormal conditions not known to be due to organisms, and which operate in a way to render the product less valuable for man's purposes; (2) Changes in which a definite causative organism may be found. Two conditions of the former class have been investigated.

Physiological Changes.

The "Blackening of Skin" in Pears.

This is a surface trouble which affects most varieties. Some varieties are apparently more "susceptible" than others. The condition develops rapidly after the removal of fruit from storage, and has given rise to the impression that the effect of bringing them into a higher temperature after some period at low temperature is the direct cause. The trouble, however, is found in store. Some well-grown Keiffer pears, just commencing to ripen, from 16-year-old trees, and handled with great care, were placed in the chambers on 5th April—two cases in each chamber, one case wrapped, the other unwrapped. On 24th July these were all examined, and the extent of "blackening" classified as trace, medium or bad, according to its extent. The examination took place immediately after removal from store, and the results are set out in Table III.

Table III.

Chamber No.	Temperature.	Sound.	Slight.	Medium.	Very bad.	Moulds.
8 Unwrapped ..	37° F.	0	23	38	78	0
8 Wrapped .. .	..	1	5	10	175	0
7 Unwrapped .	37° F.	2	9	19	130	8
7 Wrapped .. .	..	3	1	2	140	3
6 Unwrapped .	37° F.	12	16	17	61	9
6 Wrapped .. .	..	1	1	2	152	0
5 Unwrapped	34° F.	131	28	2	0	3
5 Wrapped .	..	147	0	0	0	..
4 and 3 ..	34° F.	All sound	..	..	..	..
2 and 1 . ..	32° F.	All sound	..	..	..	..

Three cases which had been stored at the three different standard temperatures were sent to the Western Market for sale, but within 24 hours, and before sale had been effected, the two which had been stored at 34° F. and 37° F. had turned black; that stored at 32° F. remaining sound and saleable.

On 6th September, 1922, some Keiffers from a neighbouring orchard which had been picked greener, remained "black-free" long enough to be sold, although the Keiffers, from the same lot as the three samples above referred to and stored in the same chamber were all black and could not be sold.

Wrapping has little, if any, effect on the development of "blackening." It was noted that the pressure of a piece of wood or even the finger was sufficient to produce a brown mark after a short time. Letters or figures may be traced with the lightest rub; in a quarter of an hour they stand out on bold black outline.

Thus—

(1) The degree of blackening is definitely a function of temperature; in a definite space of time at a higher temperature blackening is more severe than at a low temperature.

(2) The more mature the Keiffer is when picked, the earlier will it blacken.

THE CAUSE OF BLACKENING.

The leaves of deciduous fruit-trees in the autumn take on a variety of colours as a natural process in their life history. Some of these colours are derived from glucosides. Bourquelot and Fichtenholz* have isolated a substance, arbutin, a phenol glucoside from the leaves of many varieties of pears. They have also found it in the surface layer of the fruit of some varieties of pears. It is suggested that the blackening of pears in store is the result of the operation of the following system:—

$$\text{Arbutin} \xrightarrow{\text{hydrolysis}} \begin{cases}\text{hydroquinone} \\ \text{glucose}\end{cases} \xrightarrow{\text{oxidation}} \begin{cases}\text{quinone} \\ \text{water}\end{cases}$$

It would seem that arbutin and an hydrolytic enzyme exist side by side, glucose being split off and used in respiration. That the cells must be injured in order to produce blackening suggests that the oxidase system or portion thereof is held in a neighbouring cell.

Attempts by Bourquelot's method to isolate arbutin from Keiffer pears, which had been in storage for some months, though were not blackened, were not successful. Possibly the arbutin, if ever present, had been converted to hydroquinone, and had not had further opportunity to be oxidised owing to the non-injury of the cells containing the oxidose system and the hydroquinone. This theory is supported by the fact that any exposed peelings, if not quickly put into the alcohol, turned black at its edges. Further attempts to isolate arbutin will be made this season with fresh material.

RECOMMENDATIONS.

1. Pick Keiffer pears when fully developed but green. This will lessen the blackening: further, the stone cells are then less well developed, an objectionable feature when this pear is allowed to mature fairly well on the tree.

2. Store at as low a temperature as is possible—30-31 deg. F. is probably as low as is practicable, certainly as low as is desirable.

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* *Jour. Pharm. Chem.*, Vol. II., pp 97-104.

Just as Bourquelot could not find arbutin in the outer layer of all pears, so we find that certain varieties do not "blacken" perceptibly in storage. There are gradations in the amount of "blackening." Of pears in the experimental chamber the variety Keiffer was by far the worst, followed by L'Inconnu, Madame Cole, Vicar of Winkfield, Beurre Bosc, which all commenced to show "blackening" after 1st September. Winter Cole, Josephine de Malines, Winter Nelis, did not show any signs of "blackening," the former till September, the latter two till November, at which times they were sold.

FLESH COLLAPSE.

This is a complete collapse of areas of cells of the flesh, attended with more or less browning of the flesh. It is common both with pears and apples, and will be discussed more fully when the experiments with apples are being dealt with.

(1) Some varieties are more susceptible than others. Winter Coles are limited in their storage life on account of flesh collapse. July 1st is probably the commercial limit of storage at 32° F. for this variety on this account.

(2) Pears off young trees collapse from the centre. One three-case lot of Packham's Triumph pears from Drouin, of large size, and from four-year grafts, was examined on 8th July, 1922, and although green and firm outside, the pears were all found to have softened inside.

Decay Due to Organism.

With most varieties of pears this is the more serious type of loss. For the majority of fungi to gain entrance there must be an injury to the fruit. Thus the amount of loss due to decay organisms reflects the efficiency of the mode of, and the care used, in handling the fruit.

The main factors determining the amount of this loss are:—

(1) The variety of fruit and growth conditions in the orchard.
(2) Its maturity.
(3) Its handling during picking, packing, and storage.

The main causative organisms found were *Penicilliums sps.*, of these *P. glaucum* (Link) is the most prevalent. Besides these *Sclerotinia fructigena* (Pers.) Schr. and *Botrytis cinerea* (Pers.) have been identified. In storage this latter species tends to propagate vegetatively, the mycelium forming a "nest" of rotten pears. The stalks of pears are frequently infected first, and mould may spread down infecting the end of the fruit.

Results of Examination of Pears Stored Under Different Systems of Refrigeration and of Temperature.

(1) Winter Cole pears, put into store 25th March, examined 7th July, 1922—

(*a*) Average percentage sound—
At 32° F., 67%; at 34° F., 70%; at 37° F., 53%.

(*b*) Average percentage sound—
Under direct expansion system 70%; air circulation system, 60%; combined systems, 56%.

However, in the figures given, variations of figures in the actual counts at the different temperatures and within the systems enumerated, are as great as the average differences between the different sets of figures.

(2) Winter Nelis pears, Doncaster District.

TABLE IV.—(*a*) A COMPARISON OF WRAPPING EVERY LAYER, EACH ALTERNATE LAYER, AND UNWRAPPED PEARS UNDER THREE DIFFERENT SYSTEMS OF REFRIGERATION ALL AT 34° F.

—	Sound	Mould	Sound	Grade
			per cent.	inch.
Chamber 4—Air Circulation				
Every layer wrapped	143	20	87	2½
Alternate layer wrapped	118	56	68	2¾
Unwrapped ..	139	72	69	2½
Chamber 3—Direct and Expansion				
Every layer wrapped . .	132	24	84	2½
Alternate layer wrapped	97	40	70	2¾
Unwrapped .. .	88	39	69	2¼
Chamber 5—D.E. and Air Circulation				
Every layer wrapped . .	125	21	86	2½
Unwrapped . ..	90	48	65	2¾

A consideration of the table shows:—(*a*) The value of wrapping; to be effective every layer should be wrapped. (*b*) No difference in percentage of mouldy fruit under the different systems of refrigeration.

The effect of irrigation on storage capacity was investigated.

TABLE V.—PEARS FROM IRRIGATED AND UNIRRIGATED PLOTS STORED AT 34° F., WITH THE DIRECT EXPANSION AND AIR CIRCULATION SYSTEMS COMBINED.

-	Sound	Mould	Sound	Grade
			per cent.	inch.
Irrigated—				
Wrapped . ..	196	5	97	2¼
Unwrapped . . .	156	37	80	2¼
Unirrigated –				
Wrapped . . .	125	21	86	2½
Unwrapped	90	48	65	2½

NOTE.—Fruit from one orchard at Doncaster. Irrigation date about a fortnight before picking.

This table shows that Winter Nelis pears from an irrigated orchard keep as well as fruit from an unirrigated orchard. Large fruit, both on account of its greater size, involving possible constitution as well as sheer weight, and less numbers in a box will show a greater percentage of loss, due to mould (*see later*). Temperature has a decided effect on the prevalence of mould. The result of storage at different temperatures is given below.

TABLE VI.—WINTER NELIS PEARS UNDER DIFFERENT CONDITIONS OF TEMPERATURE.

--	Temperature	Sound.	Mould.	Flesh Collapse.	Sound.	Remarks.
					per cent.	
Chamber 1 (*a*)	At 32° F.	103	15	12	90	2½ inches, all fruit wrapped
2 (*a*)	At 32° F.	103	12	5	90	2½ inches, alternate layers wrapped
3 (*a*)	At 34° F.	106	39	1	70	2½ inches, all wrapped
3 (*b*)	. .	106	34	.	74	Average from Table IV.
4 (*a*)	At 34° F.	57	48	5	46	Half-case, 2¼ inches, very badly handled, unwrapped
4 (*b*)	. .	133	49		74	Average from Table IV.
5 (*a*)	At 34° F.	92	50	5	65	2½ inches, unwrapped
5 (*b*)	. .	108	35	.	75	Average from Table IV.
6 (*b*)	At 37° F.	119	25	.	82	2½ inches, alternate, wrapped

(*a*) Sample fruit from north, Beechworth. (*b*) Sample fruit from south, Doncaster.

From this table it will be seen that the average percentage of mould at different temperatures is at 32° F.—90%; at 34° F.—67.5%; at 37° F.—82%.

Unfortunately the experiment in chamber 6 (*b*) included only one case; there, however, is definitely less mould at 32° F. than at 34° F.

Note larger percentage of "Collapsed" pears at the lower temperature (*see later* under Apples).

Abstracting from Tables 5 and 6, fruits similarly treated as regards wrapping, but of different grade, and excluding any known to be abnormally treated, *e.g.*, (*a*) table 6, we find that of grade 2¼, 88%; of grade 2½, 75%; of grade 2¾, 68%, are sound respectively. An interesting illustration of the amount of care and thought necessary for good results was provided quite accidentally with Winter Nelis pears.

One case shows (*a*) the amount of damage done by walking over cases while being stacked (one foot being placed on a half flat case); (*b*) the effect of too tight packing in one half of a case, and then nailing the lid on tightly.

TABLE VII.

	Sound	Mould.	Sound
			per cent.
(*a*) sound half	57	12	82
damaged half	35	39	47
(*b*) sound half	10	40	80
damaged half	21	35	62

Both of which examples demonstrate the great care necessary in all the periods of handling to get good results.

General Notes on the Keeping Qualities of Pears Stored in Experimental Chambers.

These notes, of course, apply only to fruit held this season, and generally only refer to a small consignment from one district.

The districts from which consignments were drawn are shown in brackets.

"Commercial life" means estimated life under commercial conditions at 32°-34° F.

1. Glou Morceau (Harcourt) from trees 24 years old, fairly large, picked when green, but fully grown; wrapped; sound from 6/4/22 till 1/8/22, which probably represents the "commercial life" of this pear in cool storage; remains firm and free from "blackening."

2. Josephine (various). A good keeping variety. Tends to wilt, especially if picked early, when it wilts badly. When picked too early also seems to develop astringency. Apparently the disappearance of tannic principles in cold storage does not continue to the same extent as it does on the tree. October to November is the limit of commercial life of this variety in storage. These pears may be kept longer in storage, but if they are, they rapidly deteriorate on removal. The flavour is well retained throughout. This variety should be picked just before turning yellow, and stored as quickly as possible. Does not "blacken."

3. Keiffer (various). A firm pear; if picked green gradually develops a beautiful yellow colour; no wilting; mould losses small; "blackening," however, very bad, and as seen before, this limits its storage life. Under some conditions, such as fairly early picking, low storage temperature, "blackening" is retarded, so that by studying these, the "life" in store may be extended. July to September represented commercial limits of fruit actually stored at 32° F. in the chambers.

4. L'Inconnu (Harcourt), very sound; picked green; tends to "blacken", this "blackening" develops slightly in cold storage after 1st October; free from mould losses. The life of this pear in storage will be determined by the same considerations that govern the storage life of Kieffer pears.

5. Madame Cole (Tunstall). A very firm pear; stores well; shows a tendency to blacken after 1st October, but not nearly so bad as the varieties Kieffer, or L'Inconnu. September 1st, probably the limit of time for successful storage for this variety. Little loss due to moulds.

6. Marie Louise (Geelong). A more delicate pear, consequently the main cause of loss is moulds; does not show "blackening." August 1st is the latest date that this variety should be held for local commercial purposes; the condition is then firm; flavour well retained and juicy; does not wilt.

7. Vicar of Winkfield (Geelong). A firm pear that stores well. The mould growth on stalk tends to infect the stalk end of the fruit; after the beginning November begins to "blacken." September 1st advisable limit of storage life; flavour good, and does not wilt.

8. Winter Cole (various). Tends to become soft and mushy on storage; the chief cause of loss is moulds; some flesh collapse, together with small amount of wilting. No "blackening" developed while in store; the safe commercial limit of life in stores about 20th June.

9. Winter Nelis (various). A firm pear; the main cause of deterioration is mould; little or no wilt; flavour fairly good, but not juicy; it does not "blacken." Commercial life extends to 1st September if, as with all other varieties of fruit, it receives reasonably good handling. In store it may be kept till November.

SUMMARY.

1. An analysis of the losses and their causes with different varieties has been attempted.

2. The causes of loss have been classified as—

   (*a*) Physiological: *e.g.*, "blackening" of Kieffer pears.

   (*b*) Due to definite causative organisms, chiefly mould fungi; shown by the losses in Winter Nelis pears.

3. The operation of the arbutin-hydroquinone-quinone system has been suggested as the cause of blackening.

4. The effects of growth conditions, of wrapping, of temperatures, of systems of refrigeration, of care in handling, have been considered in relation to the keeping quality of pears.

5. Some notes about each variety, their keeping qualities, and commercial storage "life" have been added.

[In a later issue a report on experiments in the storage of apples will be published.]

WEEDS AND THEIR ERADICATION.

(Continued from p. 109.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Flax-leaved Fleabane—*Erigeron linifolius*, Willd. Family : *Compositæ*.

This exceedingly common weed of waste lands and edges of footpaths comes from the Mediterranean region.

It is a coarse, greyish-green annual, with erect stems, that may be simple or branching, the leaves are long and narrow, those towards the top of the plant becoming linear, the small teeth present on edges of the lower leaves being absent (Fig. 57).

The flowers are numerous, of a pale-yellowish colour, and produce an enormous number of seeds, capable of being carried to and fro by the wind.

This plant can be easily hand-pulled, or it may be kept mown closely to the ground. Spraying with arsenical preparations could be effectively applied when this weed is plentiful on waste lands, railway yards, &c.

Sheep Burr, or Bidgee Widgee—*Acæna sanguisorbæ*, Vahl.
Family *Rosaceæ*.

This pest of grazing lands is a native of Australia, and is well known to everybody, especially so at this time of the year, by reason of its hooked seeds, attaching themselves to the clothing of any person incautious enough to walk into their midst.

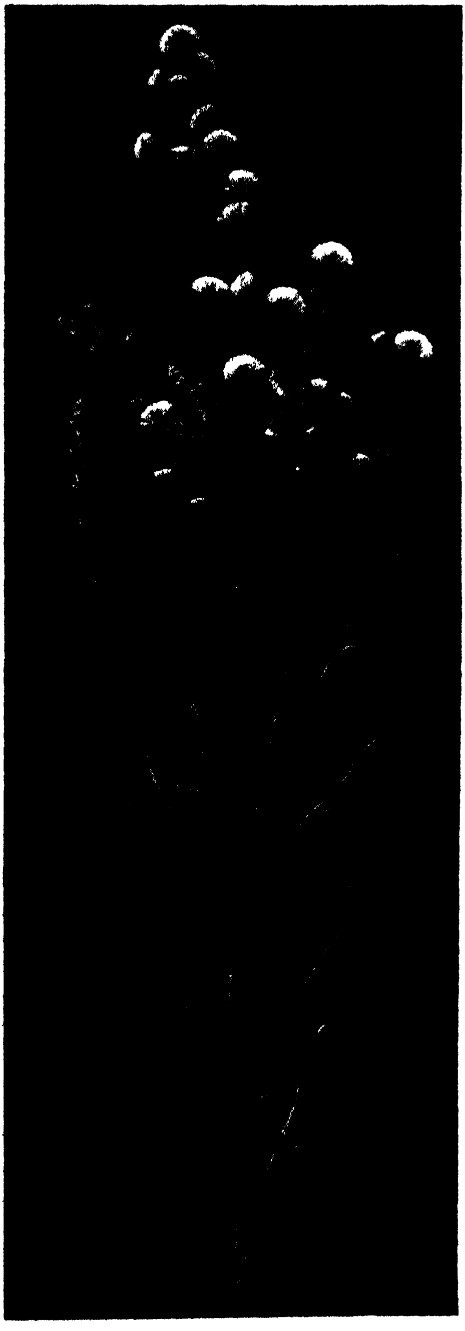

Fig. 57.—Flax-leaved Fleabane (*Erigeron linifolius*, Willd.)

This Bidgee burr (Fig. 58), when young, is eaten by sheep, and they should be of assistance in holding the weed in check.

To prevent these plants from seeding, they could either be mown or dug out, but as they usually occupy very large areas, to do this would be a very costly matter. An effective method would be to spray the plant with a weak arsenical spray during its flowering time in spring, or to apply salt to the infested areas. If an arsenical spray were used, it would necessitate the removal of stock from the land so treated until after heavy rains had fallen.

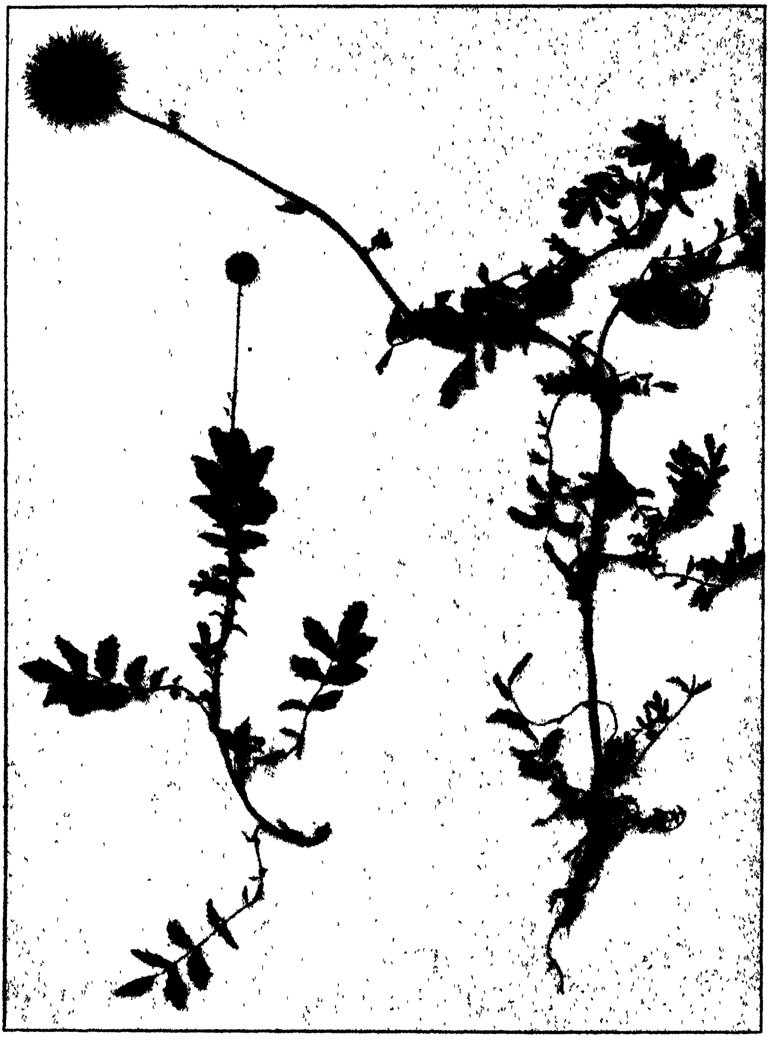

Fig. 58. Sheep Burr or Bidgee Widgee (*Acæna sanguisorbæ*, **Vahl.**)

Many people have noticed that this plant is frequently attacked by a small metallic-blue beetle, having large swollen femora. These beetles belong to the family *Chrysomelidæ,* genus *Arsipoda* of the *Halticides,* and this is of interest at the present time, when there are so many people of the opinion that beetles or other insects could be imported for the purpose of controlling St. John's wort—a plant that has taken possession of such immense stretches of country in Victoria.

In the case of the Bidgee burr, both the beetle and its host are indigenous to Australia, and although the beetle is often extremely plentiful, so, unfortunately, is also the burr.

It might be said that this beetle, being a native insect, is kept in check by its natural enemies, which, while being perfectly true, applies equally so to the burr, and so the balance of nature is maintained, both species existing in about the same proportion year after year.

Now, although the abundance of this burr must always ensure a plentiful food supply for the beetle, the latter may often be found feeding on other plants, many of which are introduced species. This appears to show that this beetle (like so many other of our native insects) is enlarging its range of host plants; this, in spite of the fact that its natural food plant remains abundant. Probably, a much quicker change to other food plants would take place if through cultivation or other causes great destruction of this burr occurred.

The great danger of insects acquiring fresh tastes as regards their food would always be present in imported insects, and in the case of phytophagus ones, introduced free of control, an acquired change of diet might easily mean disaster for Victoria, or even Australia.

If it were possible for such an insect or insects to succeed in exterminating the plant for which purpose they were introduced, it would probably then be found that they had already discovered other plants suitable to them for carrying on the species, and it is most unlikely that they would obligingly die out, as so many people appear to expect of them.

(*To be continued.*)

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

GREEN MANURES.

If a cover crop of leguminous plants is required for green manuring a start at planting may now be made. This can be done only when all the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before the winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will adequately cover the surface before winter.

CULTIVATION.

Should the weather remain hot and dry it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

PESTS.

No codlin moth-affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

All rust-affected foliage and fruit of plum and peach trees, as well as all other stone fruits that have been attacked by this and other fungus diseases, such as shot-hole, &c., should be burned if possible This will minimize the possibility of future attacks

The Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through until the spring time.

The section should be well dug over for planting winter crops Before digging a light sprinkling of bonedust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus for the soil. Large plots should be avoided in winter; where such occur a path should be run down the centre. This will provide more efficient drainage The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrots, radish, cabbage, cauliflower, and swede turnip may be sown

Asparagus beds should be cleaned up and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

The Flower Garden.

All classes of spring-flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The manure should, some time previously, have been dug well in, and mixed with the soil, and all heat should have disappeared. If manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

The increasing prevalence of both bulb mite and rhizoctinia fungus in attacking bulbs makes it a matter of urgency that all bulb gardens and plots should be well dressed with lime before the bulbs are planted. The lime should be dug into the soil; and after the bulbs have been planted, a top-dressing should also be given. Each dressing need not exceed 2 ozs. per square yard. Clifts's manurial insecticide is also good.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure. In any case the feeding should not be too strong nor too frequent, and it should always be withheld before the flowers come.

All hardy annual, biennial, and perennial seeds may now be planted. Among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur the plants should be sprayed with benzole emulsion, nicotine, pestend, or soaperine, or some other preventive in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

In preparing the soil for planting the trees care should be taken not to dig small holes A small hole is simply a "pot hole," in which the winter water accumulates, and as a result the young tree roots are rotted

A large hole should be dug, or better still, the whole planting area should be well cultivated all over, and the plants or trees then set out in this cultivated area

REMINDERS FOR APRIL.

LIVE STOCK.

HORSES Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Irrigated lucerne may be scarified in autumn, Algerian oats sown, and in this way good feed provided for cows in winter. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentiful. Take care that salt lick previously recommended is available. One or two pounds of linseed cake or meal given daily should be found beneficial. In addition to its feed value, the oil in the cake or meal will counteract the effect of dry feed, which is liable to cause impaction.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape, barley (especially skinless), oats, &c., may be sown for grazing during winter.

SHEEP.—Merino and fine cross ewes, if mated early, will lamb from now on. Those in lamb to the larger British breeds of rams can be expected to give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and pick up any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching, at the same time clear wool from around teats, and from the eyes. If the ewes are attentive mothers, any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that appear ailing. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

POULTRY.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Add to drinking water one packet of Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit, shell, and charcoal should always be available.

CULTIVATION.

FARM.—Dig potatoes as they mature. Cart out and spread stable manure Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—1½ bushels, Oats; ½ bushel, Cape Barley; ½ bushel, Tick Beans; ½ bushel, Pease. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

VINEYARD.—Examine "Yema" grafts to see if strings require cutting. Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of Vinegar Flies (*Drosophila funebris*). If present, destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c.

ORCHARD.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

FLOWER GARDEN.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs. Keep dahlias tied to stakes.

VEGETABLE GARDEN.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

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THE WATER REQUIREMENTS OF FARM CROPS.

INFLUENCE OF ENVIRONMENT ON THE TRANSPIRATION RATIO.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, Victoria.

The quantity of water used in the growth of farm crops is so considerable that the water supply of the soil is frequently a limiting factor in crop production.

There are millions of acres of good soil in regions where the rainfall is just below the amount necessary to make crop raising profitable with existing methods of cultivation.

There are other regions where the rainfall would be sufficient if it were properly distributed, or if crop growth could be adjusted to use the rainfall economically. It has long been known that crops differ materially in their water requirements, but more recently it has been shown that soil and climatic conditions—*i.e.*, environmental conditions—profoundly affect the water requirements of a given crop. These are matters of scientific interest, and of great practical importance, more especially in countries with a large area of land of low rainfall.

Any investigations which will throw light on the relationship between the available moisture in the soil and the magnitude of crop production, are of fundamental importance to countries with large areas of arid land.

Investigations relating to the water requirements of farm crops have been carried out in Europe, India, and the United States of America, but hitherto this subject has received no attention from workers in Australasia.

This paper gives an account of investigations conducted over a period of five years to determine, for Victorian conditions, the relative water requirements of farm crops, and the influence of season, degree of moisture-saturation, fertilizers, and different crop varieties on the transpiration ratio for dry matter and grain.

The plant physiologist has devoted much attention to the organs of the plant which control transpiration, and has compared the losses by transpiration with the leaf area, relative abundance of stomata, t activity of the upper and lower sides of the leaf, &c. In such inves gations the water transpired is usually expressed in terms of unit a of leaf.

The relation between transpiration and temperature, light, humidity has also been measured, but usually only for short periods of time, and with plants of non-agricultural interest.

For the determination of water requirements of farm crops, we desire to know how much water is used by the crop throughout its period [illegible] and we need a method of expressing the quantities that will apply to all cases. The usual method is to express the quantity of water transpired in terms of dry matter produced. The water requirement of any given crop is the ratio of the weight of water transpired by the crop during growth to the dry matter produced. This is called the Transpiration Ratio.

Summary of Previous Investigations.

The earliest determinations of the water requirements appear to have been made by Woodward (1699). Woodward used water cultures, and grew plants of known green weight in stoppered vials, and kept an accurate record of the water consumed.

He found that the water requirements of plants grown in spring and rain water were higher than of those grown in water containing more soluble matter, and that when impure water was distilled the water requirement was higher when plants were grown in the distillate than when grown in the residue.

Most of the earlier workers who studied transpiration did not carry their plants beyond the seedling stage. Lawes (1850) was the first to study transpiration for the whole period of growth of a crop. He appears to have been the first to determine the influence of fertilizers on the water requirements of the crop. According to his results, the average transpiration ratio for wheat, barley, and clover was reduced from 258 to 209 by the use of mixed mineral and ammoniacal manures.

Fittbogen (1873) determined the effect of varying degrees of soil saturation on the water requirement of oats. He concluded that the water requirement of oats decreased gradually with decreased water content.

Marie-Davy (1875) reported experiments designed to show the effect of soil type on the water requirement of wheat expressed in terms of grain produced.

Wollny (1877) determined the water requirements of crops in pots measuring 13 x 20 centimetres. Surface evaporation was prevented from the pots. He records ratios ranging from 233 in the case of maize to 912 for buckwheat.

Hellriegel (1883) determined the water requirements of eight types of crops, and tested the effects of fertilizers and varying degrees of moisture saturation on the Transpiration Ratio. His results generally indicate that the water requirement varies with the crop, the water content of the soil, and the type of fertilizer used. He used open pots containing four kilos of sand, and a correction had to be made for direct evaporation from the soil, and this introduced an element of uncertainty into his results.

King (1892-95 and 1905) conducted a large number of tests under field conditions with maize, barley, oats, clover, and potatoes, in barrels and large pots. No attempt was made to check surface evaporation, nor was any attempt made to correct for surface evaporation; consequently, his results are inconclusive.

Heinrich (1894) showed that the water requirement of oats grown in water cultures is increased if the nutrient solution is lacking in any nutrient. He also found that the transpiration ratio decreased as the concentration of the nutrient solution was increased.

Liebscher (1895) measured the water requirements in clay and sand treated with varying fertilizers. Complete fertilizer gave a lower water requirement, both in sand and clay, than the check pots.

Schrœder (1896) showed that there was a reduction in the water requirement of barley when the moisture content of the soil was decreased.

Wilfarth and Wimmer (1902) determined the effect of potash and other salts on the water requirements of potatoes, tobacco, buckwheat, mustard, and oats in the field, in pots 15 x 20 c.m., and 22 x 20 c.m. In general, the experiments showed a decided decrease in the water requirements for potatoes when moderate amounts of potash are added. The addition of nitrogen lowered the water requirement. Surface evaporation from the soil was not prevented, nor was a correction made for evaporation.

Ohlmer (1908) compared the water requirements of crops with varying combinations of fertilizers in open pots, maintained at 45 per cent. and 75 per cent. of water-holding capacity. The lower water content in all cases gave a lower water requirement.

Wimmer (1908) tested the water requirements of chicory, ryegrass, beets, and carrots in pots 20 x 33 c.m., under field conditions. Nitrogen lowered the water requirement, but potash did not produce any material effect.

Widstoe (1909) measured the water requirements of maize and wheat in four types of soil, in pots 61 x 76 c.m. The experiments extended over four years, and showed clearly that crops grown in unproductive soils had an increased water requirement. He also determined the effect of fertilizers on the water requirements of maize. The results show a reduction in the water requirement with the fertilizer, but the effects varied with the season.

Leather (1910-11) investigated the water requirements of crops grown in various types of Indian soils, effect of fertilizers and soil mass on the water requirements. He found that the same crop showed a wide variation in water requirements when grown on different soils. The factor influencing the Transpiration Ratio appeared, however, to be the plant food of the soil rather than the texture of the soil. He also showed that there was a reduction in the water requirement when liberal dressings of fertilizers were applied. His data are conclusive as to the effect of soil mass on the water requirement. An insufficient soil mass increases the water requirement, probably because of insufficient food supply.

Kiesselbach (1910) determined the water requirement of maize grown in river sand kept saturated with Schimper's normal nutrient solution. Four concentrations were used, and the plants were grown in the field in potometers 25 x 30 c.m. With the exception of the highest concentration, which reduced the growth of plants, the results showed a slight increase in the water requirement as the concentration of the solution was diminished.

Kiesselbach and Montgomery (1911) grew maize in covered pots 41 x 91 c.m., under varying conditions of soil saturation, ranging from 35 per cent. of saturation to 100 per cent. There was a very small margin of available moisture in the driest pots, and the crops often wilted. The results generally indicated a greater water requirement for high saturation than for low degrees of saturation.

Montgomery and Kiesselbach (1912) determined the water requirement of maize grown in three types of soil—fertile, intermediate, and infertile. The pots, 41 x 91 c.m. in size, were covered, and clay was used at the joint between the cornstalk and the oilcloth cover to exclude rain. A reduction in the water requirement was observed with an increase in soil fertility, and when liberal dressings of fertilizers were used, the water requirements from all three types were uniform.

Briggs and Shantz (1913, 1914, 1915) conducted tests in Akron, Colorado, with over 100 different crops and varieties, in pots 41 x 61 c.m., inside a screened enclosure. Surface evaporation was prevented by the use of tight-fitting covers, and rain was excluded. The crops tested show a range in water requirements varying from 275 for millet to 1,068 for lucerne.

Kiesselbach (1916) records the results of experiments showing the relationship between humidity and transpiration and ash content. Maize was grown in pots 41 x 91 c.m. The results showed that the water loss from a maize plant is affected in a similar manner by changing climatic conditions, as the evaporation from a free water surface. The transpiration rate is dependent upon humidity. A difference of 22 per cent. in relative humidity and 1.7° F. during the day caused a difference of 42 per cent. in the Transpiration Ratio, 38 per cent. in the transpiration from a unit of leaf area, and 46 per cent. in the evaporation from a free water surface. Transpiration produced a marked reduction in leaf temperature. An increase in atmospheric humidity which lowered the evaporation 47 per cent., reduced the water transpired per gram of ash content 38 per cent., and per gram of dry matter 40 per cent. Less water was transpired per gram of ash content, and also per gram of dry matter, in a relatively low soil saturation than where an abundance of water was used.

Hasselbring (1914) determined the effect of shading on transpiration. Tobacco plants grown in the open absorbed 28 per cent. more water than those grown in shade. Plants which transpired the greater quantity of water contained the smaller percentage and smaller absolute quantity of ash.

Briggs and Shantz (1916) recorded the results of investigations to show the extent of correlation between transpiration and the physical factors of environment. Continuous automatic records were obtainc of air temperature, solar radiation, wet-bulb depression, wind velocity, evaporation from a water surface.

The correlation co-efficients between transpiration of different crops, considered both individually and as one population, were as follows:—

Transpiration with radiation	.50 ± .01
„ temperature	.64 ± .01
„ wet bulb depression	.79 ± .01
„ evaporation (shallow tank)	.72 ± .01
„ „ (deep tank)	.63 ± .01
„ wind velocity	.26 ± .01

Wet bulb depression and evaporation from a shallow tank exhibit the highest correlation with transpiration in all cases, while wind velocity is correlated with transpiration only to a very slight extent.

Weaver (1916) reported results of experiments with transpiration of plants affected by cereal rust. The presence of a small amount of rust accelerates the transpiration rate, and a close quantitative relationship was established between the amount of pustular area and the increase in transpiration. He concluded that under conditions of disease the transpiration rate might be so excessive as to hinder the normal activities of the plant.

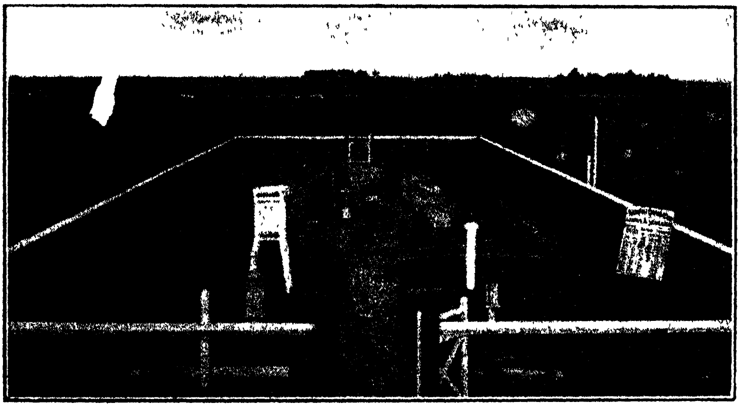


Fig. 1.—General view of Pot Enclosure, Werribee, used for the determination of the water requirements of plants.

The pots are kept at ground level in order to prevent fluctuations in temperature. In the foreground is meteorological apparatus for recording (*a*) air and soil temperatures; (*b*) hours of bright sunshine; (*c*) humidity; (*d*) rate of evaporation.

Method of Determining the Water Requirement of Crops.

The determination of water requirement of crops under actual field conditions is a matter of considerable difficulty, because of the experimental errors involved in determining the losses from the soil by evaporation, seepage, and run off.

It necessitates the measurement of added water and the estimation of the difference in the water content of the soil at the beginning and end of the experiment. This latter cannot be carried out with sufficient accuracy to give reliable data.

The most satisfactory method of determining the water requirement is to grow the crops in pots, and to determine the transpiration by loss in weight of the pot with its contained plant. The growing of crops in pots involves departure from field conditions, but for a comparative study of different crops grown in a uniform manner, no serious error is involved. The use of pots eliminates losses by seepage, and the only water losses are those caused by transpiration by the crops, and evaporation from the soil.

To obtain accurate records of transpiration, the losses by evaporation from the soil must be either eliminated or reduced to negligible amounts.

Check pots without plants, *i.e.*, check pots of bare fallow, may be used, provided proper precautions are taken to represent the losses by evaporation. If pot experiments are conducted under field conditions, and the crops are exposed to rain, the losses from the fallow pots may be considerable, especially where light showers followed by high winds are frequent. The water lost by evaporation may then form siderable proportion of the total losses by transpiration and evap in which case the experimental error may be considerable.

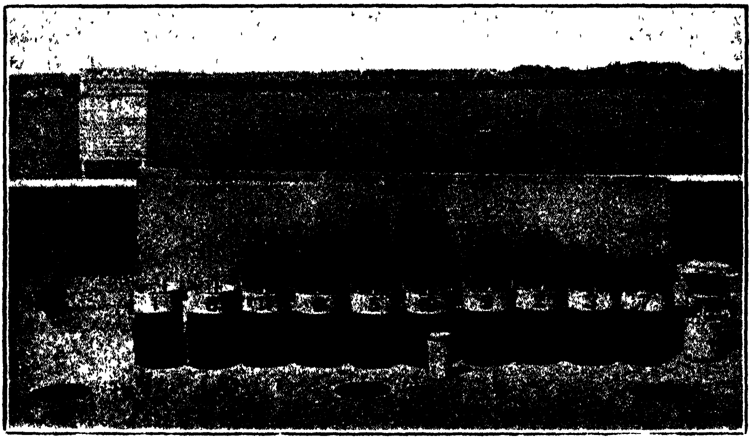


Fig. 2.—Pot experiments to determine the water requirements of farm crops.

Each pot holds 280 lbs. of soil. Pots 1 and 8, Bare Fallow; 6 and 11, Algerian oats; 2 and 9, Federation wheat; 5 and 10, Cape barley; 3 and 7, Lucerne. On the right is the water collector, and in the foreground a rain gauge The pots are placed in the soil in order to keep the temperature of the pot the same as that of the surrounding soil.

If the tests are made in an enclosure protected from rain, evaporation losses may be reduced to negligible amounts by the use of fine gravel mulches on the surface of cropped and fallow pots, and by applying the water necessary through specially constructed watering tubes.

Water Requirements under Field Conditions.

The first investigation was conducted in pots under field conditions at the State Research Farm, Werribee, in 1914.

The object of the test was to determine the transpiration ratio for wheat, barley, oats, lucerne, and summer-grown wheat, and to measur the rate of transpiration of the crops at different seasons of the year.

The pots used in the experiment were made of galvanized iron strengthened by circular bands, and fitted with handles and air tubes. The air tubes were required in times of heavy rainfall to remove surplus water from the pots and to prevent water logging.

The pots were 15¾ inches in diameter and 27 inches deep, and held 250 lbs. of soil, at 50 per cent. of saturation.

The pots were filled with Werribee clay loam resting on clay subsoil. A layer of coarse gravel was placed at the bottom of the pot to facilitate drainage, and a layer of fine gravel on the surface to reduce evaporation. The pots were placed in the ground to a depth of 25 inches, with the soil surface in the pots on ground level. They were exposed to weather in a wheat field, and corrections made for rain and evaporation.

The amount of water falling on the pots was measured by two standard rain-gauges and two specially constructed water measurers, with the same catchment areas as the pots, but fitted with a funnel which conveyed the water into a closed receptacle. The amount of rain water collected in the water measurers was checked against the quantity of rain registered in the gauges each day.

The pots were weighed weekly throughout the growing period on a steelyard turning to a one-tenth of a pound, and the pots were brought to constant weight each week by the addition of water. The season proved to be one of the severest droughts on record.

The following table summarizes the results obtained:—

TABLE SHOWING WATER REQUIREMENTS OF CROPS GROWN UNDER FIELD CONDITIONS, STATE RESEARCH FARM, WERRIBEE, 1914-15.

Crop.	Period of Growth. (days).	Water Used.	Water Lost by Evaporation.	Water Transpired.	Weight of Dry Matter Produced.			Transpiration Ratio.	
					Straw.	Grain.	Total.	Dry Matter.	Grain.
Wheat—		lbs.	lbs.	lbs.	grams.	grams.	grams.		
Federation ..									
Pot 2 ..	210	134·5	52·1	82·4	55·95	36·80	92·75	402 } 409·5	1,013
Pot 9 ..	210	139·2	52·1	87·1	57·49	37·01	94·50	417	1,065
Barley—									
Cape—									
Pot 5 ..	203	131·8	49·4	82·4	59·30	44·96	104·26	312 } 337·1	712
ot 10 ..	203	150·4	49·4	101·0	72·75	53·28	126·03	362	818
s—									
Algerian—									
Pot 6 ..	203	164·1	49·4	114·7	81·74	36·14	117·88	441 } 437	1,440
Pot 11 ..	203	137·3	49·4	87·9	56·25	35·37	91·62	433	1,128
Wheat—									
Federation—									
Summer grown									
Pot 4 ..	137	184·8	26·5	158·3	59·75	39·75	99·50	716 } 678·5	1,794
Pot 12 ..	137	220·2	26·5	193·7	85·50	50·60	136·10	641	1,738
Lucerne—									
Hunter River.									
Pot 3 ..	365	499·1	84·5	414·6	..	..	274·6	685 } 684·5	
Pot 7 ..	365	546·6	83·5	463·1	..	..	307·3	684	..

The water requirement is expressed as a ratio of the water absorbed by the plant during its growth to the dry matter produced. This ratio is called the Transpiration Ratio.

The results of the tests at Werribee show that winter-grown cereals, even in a drought year, have a comparatively low Transpiration Ratio. The Transpiration Ratio for dry matter shows a fairly close agreement with the duplicate pots, but that for grain shows considerable divergence, mainly owing to the varying percentage of grain and straw.

The Transpiration Ratio, expressed either in terms of dry matter or grain produced, for barley is considerably lower than either wheat or oats.

The Transpiration Ratio for lucerne is, approximately, 75 per cent. higher than that of the average of the three winter-grown cereals.

Summer-grown wheat, with a Transpiration Ratio of 678.5, has a 66 per cent. higher water requirement than the winter-grown wheat of the same variety, notwithstanding the fact that its growing period is 73 days less than winter-grown wheat.

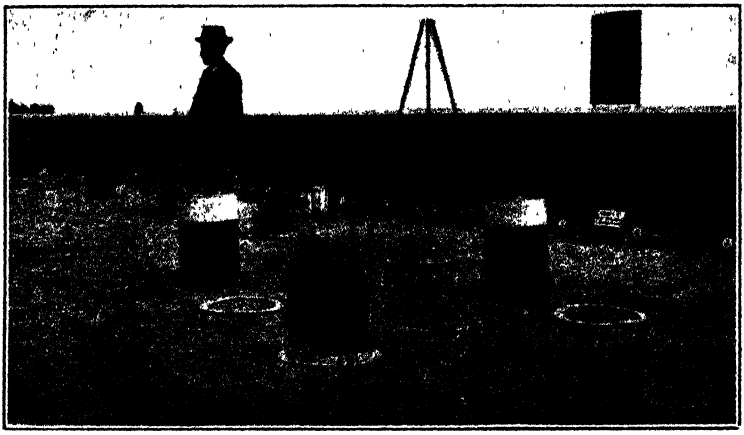


Fig. 3.—A closer view of pot tests showing construction of pots and growth of barley and lucerne in early spring.

As an inch of rain falling on 1 acre is equivalent to 101.28 tons of water per acre, we may express the water requirement of the crops tested in terms of inches of rain for the season 1914:—

Crop.	Inches of Rain required to Produce.		Number of bushels produced per acre for each inch of rain.
	One ton Dry Matter.	One ton Grain.	
Wheat (winter grown)	4·04	10·25	3·63
Wheat (summer grown) ..	6·69	17·34	2·15
Barley (winter grown)	3·33	7·55	5·93
Oats (winter grown)	4·31	12·65	4·42
Lucerne	6·71	..	..

From this table it will be seen that, during the drought year 1914, winter-grown wheat produced the equivalent of 3.63 bushels

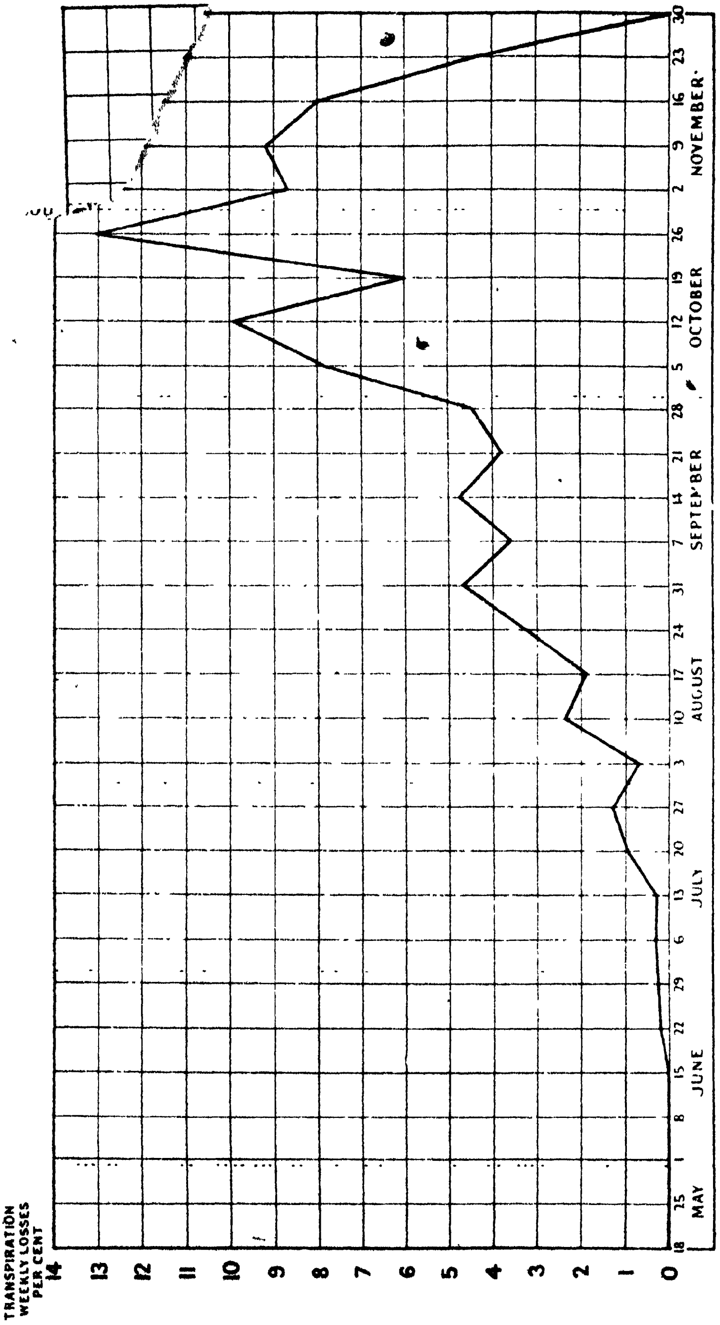


Fig 4.—Amount of water required weekly by a wheat crop throughout its period of growth expressed as percentages of the total water used.

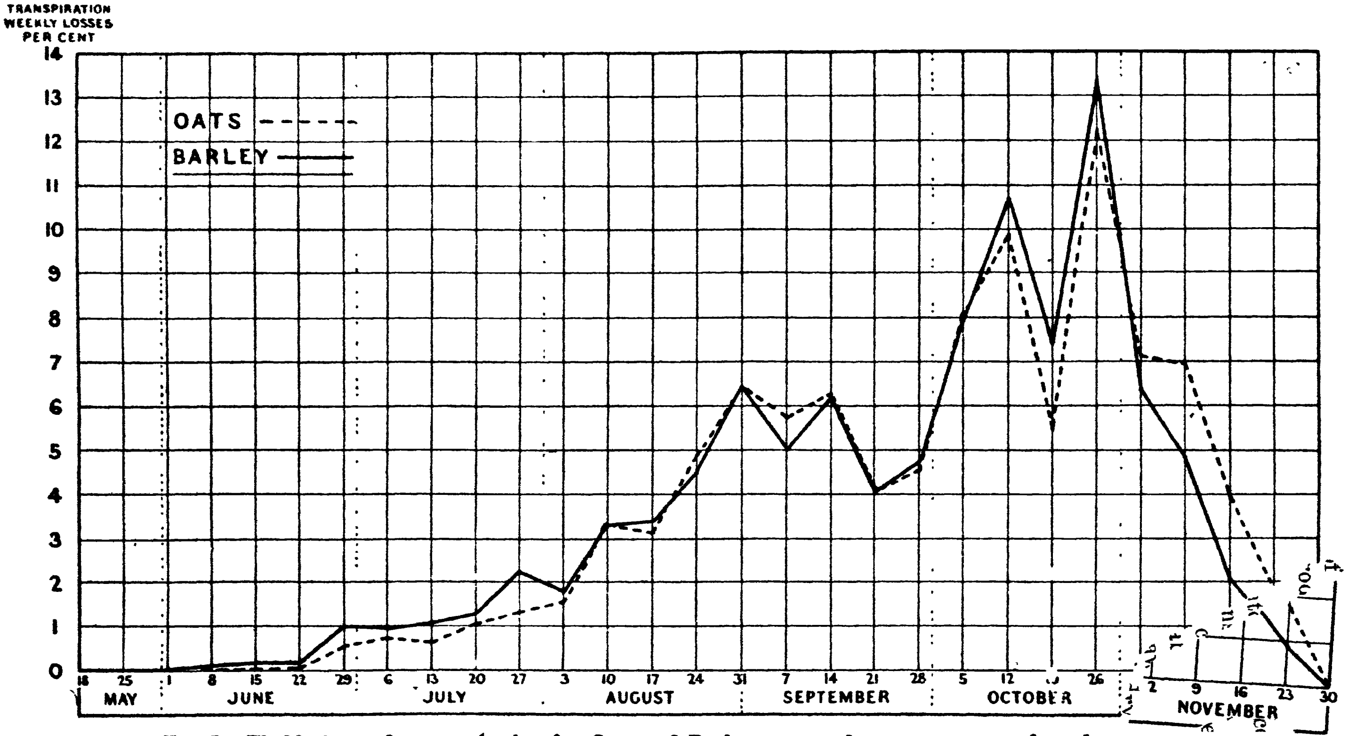


Fig. 5.—Weekly losses by transpiration for Oats and Barley expressed as percentages of total t

wheat for each inch of rain transpired by the crop. Summer-grown wheat of the same variety produced only 2.15 bushels for each inch received. On the other hand, barley produced grain at less water cost than any other cereal. No less than 5.93 bushels of barley (50 lbs. per bushel) were obtained from each inch of rainfall transpired.

Two other sources of loss occur from crops growing in the field, viz., losses by seepage and losses by evaporation from the soil. The former loss may be considerable under irrigation conditions, or in seasons of heavy rainfall, or when rain falls in heavy showers. In the cereal belt of Victoria losses of this nature are practically nil. The other source of loss—evaporation from the soil—may be considerable. It varies with the nature of the soil, condition of the surface crust, amount of shading given by the crop, and with the depth of penetration of the rain, &c. A steady, soaking rain will be more useful than a rain of equal amount spread over many days and followed by strong, drying winds.

We are here concerned only with those losses which occur through the crop, *i.e.*, by transpiration.

The pots in which the crops were grown were weighed weekly throughout the period of growth. A record was, therefore, taken of the transpiration losses throughout the crop-growing period. Such weekly losses, expressed in terms of percentage of the total transpiration, are shown graphically in Figs. 4, 5 and 6.

Figure 4 shows the march of transpiration for winter-grown wheat at Werribee for the season 1914—a typical droughty year. On the whole there was a continuous increase in the rate of transpiration until the third week in October, when 13.04 per cent. of the total water used was transpired in one week. From this stage, there was a rapid decline in the rate of transpiration until 30th November, when the crop matured.

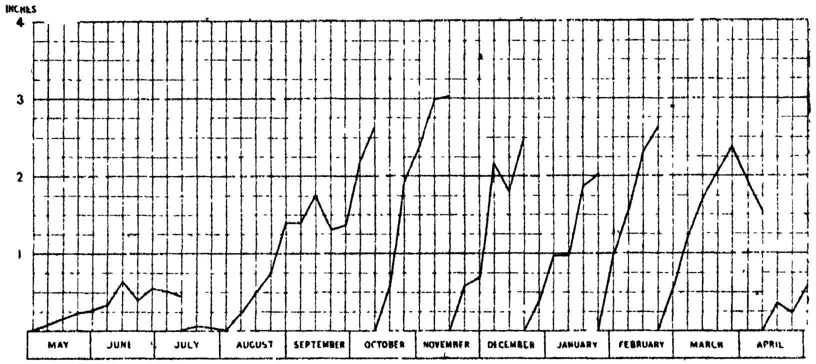
The march of transpiration for oats and barley (Fig. 5) was very similar to that for wheat, except that the percentage of water lost in winter and spring was higher with barley and oats than with wheat. The following table summarizes the transpiration losses each month during the growing period of the crops:—

TABLE SHOWING MONTHLY LOSSES BY TRANSPIRATION FROM WHEAT, OATS, AND BARLEY, EXPRESSED AS PERCENTAGES OF THE TOTAL TRANSPIRATION OF THE CROP.

Month.	Wheat.	Oats.	Barley.
	%	%	%
May	0·17	0·05	0·22
June	0·78	1·08	1·72
July	2·98	4·51	6·39
August	12·46	18·42	18·39
September	18·45	22·84	22·20
October	41·81	38·35	41·50
November	23·34	14·74	9·56

The period of maximum transpiration for the cereal crops corresponded approximately to the period of flowering. Though the crop growing period extended over seven months, the amount of water used during the month of October was, approximately, 40 per cent. of the total required for the whole period.

The march of transpiration for a perennial forage crop, such as lucerne, increases continuously, and reaches a maximum near the time of cutting. This is brought out in Fig. 6, which shows the weekly losses of lucerne throughout the year. These weekly transpiration losses have been expressed as inches of irrigation water per acre. Throughout the spring and summer months, the crop of lucerne transpired water at the rate of 2 to 3 acre-inches per week during its period of maximum transpiration. This amount was far in excess of the actual evaporation from a free surface of water for the same period.



March of Transpiration in Lucerne in Seven Day Periods Expressed as Inches of Water per Acre

Fig 6.

The relationship between the cumulative losses from a lucerne crop, a bare fallow, and the evaporation from a free water surface throughout the year, are shown in the accompanying chart. The losses are expressed as inches of rain per acre, and the yield of lucerne obtained at each cutting is expressed as cwts. per acre of dry matter. Seven cuttings were obtained during the year, and the crop, totalling 160.1 cwts. of dry matter, transpired no less than 53.6 acre-inches of water.

During the same period, the soil in which the crop was grown, though well mulched, lost 10 inches of water by evaporation. The total evaporation from a free water surface for the same period was 49.8 inches. The total losses by evaporation from the soil and transpiration through the crop amounted to 63.6 inches, so that the crop required, approximately, 8 inches of water to produce 1 ton of dry matter, of which, approximately, 6¾ inches passed through the crop, and 1¼ inches was dissipated by evaporation. These results were in close agreement with those obtained from field tests with 15 acres of lucerne.

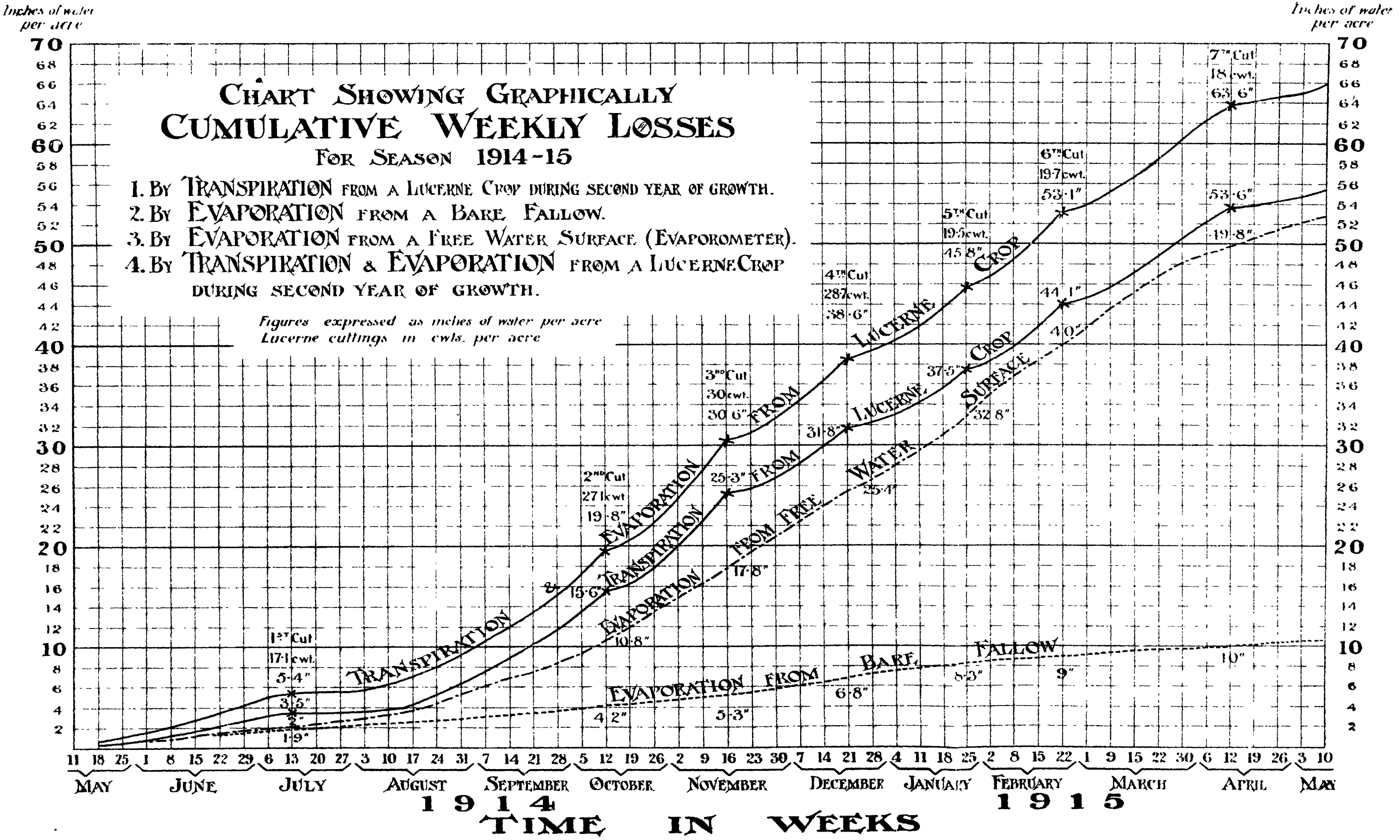


CHART SHOWING GRAPHICALLY
CUMULATIVE WEEKLY LOSSES
FOR SEASON 1914-15
1. BY TRANSPIRATION FROM A LUCERNE CROP DURING SECOND YEAR OF GROWTH.
2. BY EVAPORATION FROM A BARE FALLOW.
3. BY EVAPORATION FROM A FREE WATER SURFACE (EVAPOROMETER).
4. BY TRANSPIRATION & EVAPORATION FROM A LUCERNE CROP DURING SECOND YEAR OF GROWTH.
Figures expressed as inches of water per acre
Lucerne cuttings in cwts. per acre
Inches of water per acre
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
1st Cut
17·1 cwt.
5·4"
3·5"
2"
1·9"
2nd Cut
27·1 cwt
19·8"
15·6"
10·8"
4·2"
3rd Cut
30 cwt.
30·6"
25·3"
17·8"
5·3"
4th Cut
28·7 cwt.
38·6"
31·8"
25·4"
6·8"
5th Cut
19·5 cwt.
45·8"
37·5"
32·8"
8·3"
6th Cut
19·7 cwt.
53·1"
44·1"
40·2"
9"
7th Cut
18 cwt.
63·6"
53·6"
49·8"
10"
TRANSPIRATION & EVAPORATION FROM LUCERNE CROP
TRANSPIRATION FROM LUCERNE CROP
EVAPORATION FROM FREE WATER SURFACE
EVAPORATION FROM BARE FALLOW
11 18 25 1 8 15 22 29 6 13 20 27 3 10 17 24 31 7 14 21 28 5 12 19 26 2 9 16 23 30 7 14 21 28 4 11 18 25 2 8 15 22 1 9 15 22 30 6 12 19 26 3 10
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
1914
1915
TIME IN WEEKS

Water Requirements of Crops grown under Field Conditions at Rutherglen, Season 1914-15.

During the season 1914-15, the water requirement of farm crops was determined under field conditions at the Rutherglen Experiment Farm. Five winter-grown crops, viz., wheat, barley, oats, rape, peas, and summer-grown crops, wheat maize, ambercane, and millet, were tested. The pots used were identical with those used at Werribee, and each crop was grown in duplicate, and weighings taken weekly throughout the growing season.

The following table summarizes the results:—

TABLE SHOWING TRANSPIRATION RATIO FOR VARIOUS FARM CROPS GROWN AT RUTHERGLEN, SEASON. 1914-15.

Crop.	Water Used.	Water Lost by Evaporation.	Water Transpired	Dry Matter Produced.			Transpiration Ratio.	
				Straw	Grain.	Total.	Dry Matter.	
	lbs.	lbs.	lbs.	grams.	grams.	grams		
Wheat (Federation) .	158·2	28·75	129·45	72·35	42·04	114·39	514	518
(Winter grown)	162·0	28·75	132·25	73·95	41·0	114·95	522	
Barley (Cape) .. .	154·6	27·65	126·95	75·6	47·0	122·6	466	462·5
(Winter grown)	132·6	27·65	104·95	64·9	37·95	102·85	459	
Oats (Algerian) .	187·3	27·65	159·65	81·55	23·38	104·93	685	689·5
(Winter grown)	198·4	27·65	170·75	84·55	26·13	110·68	694	
Peas (Dun) . .	191·1	25·5	165·6	93·94	51·8	145·12	513	511·5
(Winter grown)	180·0	25·5	154·6	82·86	53·33	136·19	510	
Rape (Essex) ..	51·3	18·6	32·75	.	.	31·3	470	471·5
(Winter grown)	58·2	18·6	39·6	..	..	37·7	473	
Wheat (Federation) ..	251·4	28·0	223·4	90·5	30·95	121·45	849	876·5
(Summer grown)	242·3	28·0	214·3	81·5	25·92	107·42	904	
Ambercane .. .	188·0	29·6	265·4	.	.	328·5	366	382
(Summer grown)	200·6	29·6	264·8			301·0	398	
Millet (Hickory King) ..	188·0	24·8	163·2			166·7	445	459
	200·6	24·8	175·8			168·2	473	
Maize (Japanese)	245·1	28·3	216·8	..		140·5	700	635·5
	244·6	28·3	216·3	..		172·5	571	

Of the winter-grown cereals, barley shows the lowest transpiration, both for dry matter and grain. Of the summer-grown crops, ambercane and millet have much lower Transpiration Ratios than maize or wheat. The summer-grown wheat had a Transpiration Ratio 69 per cent. higher than winter-grown wheat of the same variety, notwithstanding that its period of growth was only four months, as compared with seven months for winter-grown wheat.

The water requirement of ambercane, despite the fact that it is a summer-grown crop, is much lower than winter-grown barley, which used water more economically than the other cereals. The duplicate pots show a fairly close agreement, except in the case of maize. The Transpiration Ratios were in all cases higher at Rutherglen than at Werribee. The relative water requirements of wheat, barley, and oats were practically the same at both centres, barley producing dry matter at a lower water cost than either wheat or oats. The same relative difference was observed in the Transpiration Ratio of winter and summer-grown Federation wheat at both centres. At Werribee, summer-grown wheat had a 65 per cent. higher Transpiration Ratio than winter-grown wheat. At Rutherglen, the Transpiration Ratio of summer-grown wheat was 69 per cent. higher than the winter-grown wheat.

Before discussing their difference in detail, we will consider the general effect of climate on transpiration.

Effect of Climate upon Transpiration.

The influence of external conditions upon the transpiration stream has been the subject of a large number of researches since the time of Hales (1748), who was the first to demonstrate that transpiration decreases as the humidity of the air increases. External conditions affect transpiration directly and indirectly, and the effect produced is, therefore, not necessarily the same as it would be in the case of evaporation from a free surface of water.

The more important external factors affecting transpiration are heat, light, humidity, and wind. Heat, light, dryness of air, and wind increase transpiration, whilst cold, darkness, humidity, and a calm atmosphere lessen it.

Temperature has a direct influence upon transpiration just in the same way as it has on evaporation from a free water surface. Moreover, temperature indirectly affects transpiration by influencing the turgidity of the tissues, movement and absorption of water, and width of the stomata.

The visible rays of the spectrum, so far as they are converted into thermal vibrations, must influence transpiration according to the heating effect they produce. Light affects the width of the stomata, and the assimilation of carbon-dioxide accelerates gaseous exchange, and thus favours transpiration. A decrease in humidity increases transpiration, whilst an increase in humidity lessens it. A plant, however, may transpire even in a saturated atmosphere, provided it is warmer than the surrounding air. On the other hand, if the plant is at a lower temperature than the surrounding saturated air, water will be condensed on the plant. Air currents and mechanical vibrations accelerate transpiration, because of the continual removal of water vapour as fast as it is formed. Vibrations of the branches caused by wind favour increased diastomatic transpiration.

Thus it is evident that, in general, transpiration is promoted by the same factors which favour evaporation; though recent studies have shown that the parallel does not hold true in detail. Every cell borders for purposes of respiration upon the inter-cellular air system, which opens to the atmosphere through the stomata. The cells adjacent to the inter-cellular spaces are turgid with water, and this water necessarily evaporates. The air within inter-cellular spaces thus becomes saturated with water vapour, and diffuses through the stomata to the relatively dry atmosphere outside. This is the physical basis for transpiration, and it explains why heat, which is an evaporation accelerator, and dryness and winds, which are diffusion promoters, increase evaporation. Transpiration is essentially evaporation, but when external conditions are such as to favour rapid evaporation from a free water surface, the stomata may close and the rate of transpiration may thereby be decreased. The opening and closing of the stomata regulate the amount of transpiration, and enable the plant to protect itself from wilting. Many plants found growing in an arid environment possess adaptations, *e.g.*, small number of stomata, well developed cuticles, waxy foliage, covering of hairs, thickened leaves, &c., all which tend to limit transpiration. Certain plants, *e.g.*, grain sorghums, reduce transpiration during hot, dry weather by rolling up their leaves.

On the other hand, plants accustomed to the saturated atmosphere of a tropical forest, possess adaptations for furthering transpiration, *e.g.*, special form and arrangement of leaves to aid rapid drainage of water, coloured cell sap, thin permeable cuticles, increased epidermal cells, complete exposure of guard cells.

Finally, apart from the external conditions, and the regulatory activity of the stomata, the rate of transpiration may be reduced, as Burgerstein has shown, by the concentration of the nutrient solution, or by the presence of certain substances in the solution. Thus transpiration is decreased by using a concentrated nutrient solution, or by the addition of small amounts of tartaric, oxalic, nitric, or carbonic acid, whereas it is increased by alkalies, such as potash, soda, or ammonia, or by the use of dilute nutrient solutions.

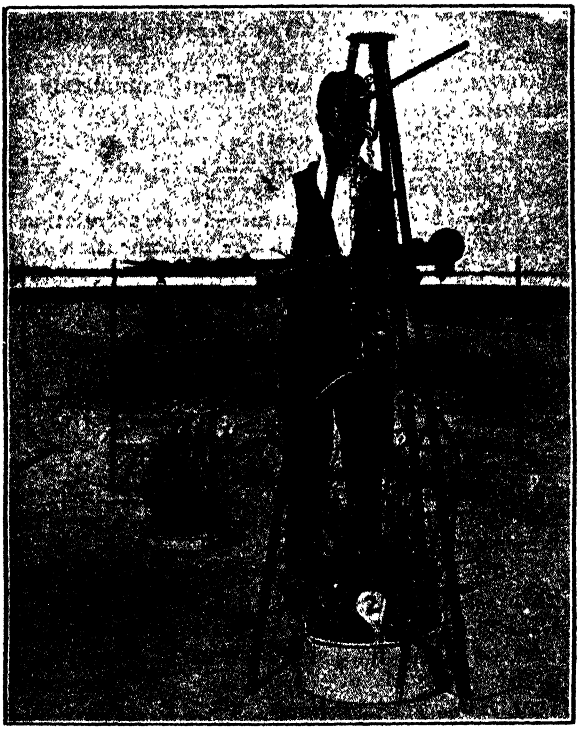


Fig. 7.—Determining the water requirements of farm crops. Method of weighing the pots.

Heinrich determined the water requirement of oats in nutrient solutions of five different concentrations. With the exception of the weakest solution, the water requirement decreased as the concentration of the solution increased. The nutrient solution used had the following composition:—4 H_2KPO_4 + $Ca\ Cl_2$ + 5 $Ca\ (NO_3)_2$ + 2 $Mg\ SO_4$ + Fe and the concentration ranged from .1 gram to 3 grams per litre.

Transpiration then is affected by (1) atmospheric conditions, (2) the activity of the plant itself, and (3) the nature and concentration of the nutrient medium from which the plant draws its mineral plant food.

The relation of transpiration to climatic factors has been investigated by Fittbogen (1873), Wollny (1877), Hellriegel (1883), Heinrich (1894), King (1905), Leather (1910-11), Kiesselbach (1910), Montgomery and Kiesselbach (1911), Briggs and Shantz (1913-14), Hasselring (1914), Kiesselbach (1916), Briggs and Shantz (1916).

Kiesselbach's researches demonstrated that the rate of water loss from maize was affected in a rather similar manner by changing climatic conditions, as it is from a physical free water surface. The maximum transpiration, as well as maximum evaporation rates, occurred between 1 and 3 p.m. Prior to this time, the increase is gradual from early morning, and following it, the rate gradually recedes until late in the evening. The rate of water loss followed the same general sequence as the diurnal climatic factors. Transpiration was reduced relatively more during the night than was evaporation. This was explained by the fact that the stomata actually closed almost completely at night, and as a result diffusion was reduced.

Transpiration was found to exert a marked reduction in the leaf temperature when the air temperature was high, and as a result exercised a valuable self-protection against water loss.

Briggs and Shantz (1916) determined the correlation between the physical factors of environment and the transpiration of the different crops, and showed that wet bulb depression and evaporation from a shallow tank exhibited the highest correlation with transpiration in all

Comparison of Water Requirements at Rutherglen and Werribee, 1914.

During the season 1914, the Transpiration Ratios for winter cereals at Rutherglen were much higher than the water requirement of the same cereals grown at Werribee. The average water requirement at each centre was as follows:--

	Werribee.	Rutherglen.
Barley	337.5	463
Wheat	409.5	518
Oats	437.5	689
Average of three cereals	394.7	556.7

The average water requirement for Rutherglen cereals in 1914 was, approximately, 44 per cent. higher than that of the same crops grown at Werribee. Werribee is situated a few miles from Port Phillip Bay. Rutherglen is 160 miles inland. A comparison of the meteorological observations at both centres during the growing period of the crop brings out very clearly the greater intensity of the water dissipating agencies at Rutherglen as compared with Werribee.

At both centres, standard instruments were used to determine the evaporation from a free water surface, maximum and minimum air temperatures, wet and dry bulb temperatures and soil temperatures at 1 inch, 6 inches, 12 inches, and 24 inches. The contrast in climatic conditions during the growing period of the crop may be seen from the following summary of the average monthly readings for evaporation, maximum air temperature, wet bulb depression, and soil temperature at 6 inches:—

Table Showing Rainfall, Evaporation, Maximum Air Temperature, Mean Soil Temperature, and Wet Bulb Depression during Growing Period of Crop at Werribee and Rutherglen. Season 1914.

Month.	Rainfall.		Evaporation.		Maximum Air Temperatures.		Mean Soil Temperature at 6 inches.		Average Temperature at 9 a.m. and Wet Bulb Depression					
									Werribee.			Rutherglen.		
	Werribee.	Rutherglen.	Werribee.	Rutherglen.	Werribee.	Rutherglen.	Werribee.	Rutherglen.	Dry Bulb.	Wet Bulb.	Depression.	Dry Bulb.	Wet Bulb.	Depression.
	ins.	ins.	ins.	ins.	°F.	°F.	°F.	°F.	°F.	°F.	°F	°F.	°F.	°F.
June	0·91	0·60	0·99	1·05	59·8	57·2	45·3	46·1	48·4	46·8	1·6	36·5	36·0	0·5
July	0·91	0·88	0·94	1·08	55·8	53·0	44·7	45·0	45·4	43·9	1·5	37·3	36·5	0·8
August	0·38	0·46	2·59	1·77	60·7	59·8	50·9	47·5	51·4	49·6	1·8	38·4	37·7	0·7
September	1·32	0·47	3·06	3·74	61·1	68·3	54·2	53·8	53·0	49·9	3·1	44·1	42·6	1·5
October	0·12	0·00	5·45	7·82	75·1	82·7	61·3	69·2	64·7	60·7	4·0	56·5	51·3	5·2
November	1·65	1·06	6·40	9·36	77·4	86·1	65·3	77·9	65·5	62·8	2·7	68·4	61·5	6·9
Monthly Average	0·88	0·58	3·24	4·14	65·0	68·0	53·6	56·6	54·7	52·3	2·4	46·8	44·2	2·6
Average for September, October, and November ..	1·03	0·51	4·97	6·97	71·2	79·0	60·3	67·0	61·1	57·8	3·3	56·3	51·8	4·5
Average for October-November	0·88	0·53	5·92	8·59	76·2	84·4	63·3	73·5	65·1	61·75	3·35	62·45	56·4	6·05

The table shows that, with respect to those physical factors in environment which directly affect transpiration, and which show the closest correlation with it, viz., evaporation, temperature, depression of wet bulb, the average readings for Rutherglen were considerably higher than those at Werribee. The average evaporation, temperature, and wet bulb depression for the growing period of the crop, is, however, not such a useful basis for comparison as the average of these physical factors during the period when the crops approach the stage of maximum transpiration, for, as Briggs and Shantz observed, "the transpiration co-efficient of cereals increases exponentially during the early stages, and reaches a maximum shortly after flowering."

The march of transpiration for wheat expressed in terms of percentages of the total losses, for season 1914, at Werribee, is illustrated graphically in Fig. 4. This graph shows the march of transpiration for a wheat crop expressed as percentages of the total transpiration. The daily losses were very small during May, June, and July, the total loss for these three months being only 3.93 per cent. of the total. They increase rapidly, however, in August and September. During October, wheat, barley, and oats were at their period of maximum transpiration. Of the total water transpired for the season, 41.8 per cent. was required in October for wheat, and no less than 83.6 per cent. during September, October, and November. Hence the averages for the month of maximum transpiration, *i.e.*, October, or for the period September to November, inclusive, are of far greater significance than the mere averages for the growing period. During the month of maximum transpiration, the average maximum air temperatures was 7.6° F. higher at Rutherglen than at Werribee. The mean soil temperature at 6 inches was 7.9° F. higher, and the average wet bulb depression 1.2° F. greater. The evaporation from a free water surface, which closely approximates a summation of the physical environmental factors, was 7.82 inches at Rutherglen, and 5.45 inches at Werribee, *i.e.*, an increase of 44 per cent. at Rutherglen.

For the whole period September to November, during which approximately 83.6 per cent. of the total water was transpired, the average monthly evaporation was 6.97 inches at Rutherglen, as compared with 4.97 inches at Werribee, *i.e.*, an increase at Rutherglen of 40 per cent.

Thus, while the average transpiration for wheat, barley, and oats showed an increase of 44 per cent. at Rutherglen, as compared with Werribee, the evaporation during the month of maximum transpiration was 44 per cent. greater, and the average evaporation for the three months, September to November, was 40 per cent. greater at Rutherglen than at Werribee.

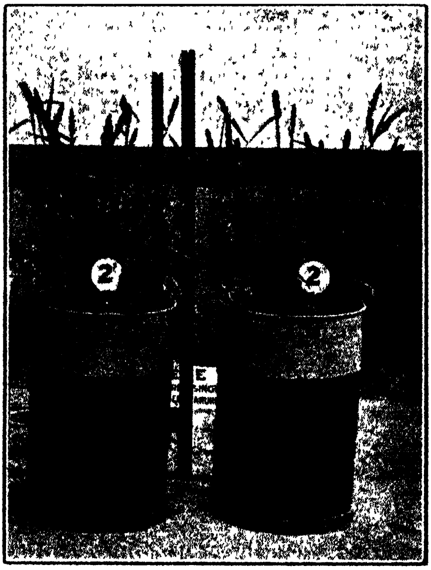


Fig. 8.—Determination of water requirements of summer forages, Rutherglen. First cutting of Japanese millet.

From this, we may reasonably infer that the water requirement for cereals in any given season will vary from district to district with the intensity of the physical environmental factors, and that it closely follows the relative intensity of these factors as expressed in the evaporation from a free water surface during the period of maximum transpirational activity. Evidence will be submitted later to show that the water requirement of a given series of crops varies from season to season, and that the seasonal variation in the transpiration ratio is closely related to the evaporation from a water surface during the period of maximum transpiration.

Field Tests at Rutherglen, Season 1915.

The field tests at Rutherglen were repeated in 1915 with the winter-grown crops—wheat, barley, oats, rape, and peas—using the same set of pots as were used the previous year. The season 1915, following on the record drought of 1914, proved to be one of the best seasons for winter-grown crops ever experienced in the State. Wheat crops throughout Victoria grew luxuriantly, and the harvest was a record for the State. The crops in the pots were very luxuriant, as was shown by the large quantities of dry matter and grain harvested from each, as compared with the previous reason. The water requirements, expressed in terms of dry matter, were relatively low, and did not exhibit the striking contrast shown during the previous year. The following table summarizes the results:—

TABLE SHOWING WATER REQUIREMENTS OF CROPS GROWN UNDER FIELD CONDITIONS, RUTHERGLEN EXPERIMENT STATION, SEASON 1915-16.

Crop.	Days Growing.	Water Used.	Evaporation from Fallow Pots.	Water Transpired by Crop.	Dry Matter Produced.			Transpiration Ratio.		
					Straw.	Grain.	Total.	Dry Matter.		Grain
		lbs.	lbs.	lbs.	grams.	grams.	grams			
Barley (Cape)—										
Pot 1	211	310·6	59·6	251·0	300·3	154·1	454·4	251	270·5	740
Pot 9	..	393·5	59·6	333·9	322·4	199·6	522·0	290		759
Rape (Essex)—										
Pot 2 (two cuts) ..	211	361·9	59·8	302·1	..	..	416·8	328	313	..
Pot 8 (two cuts) ..	196	329·7	54·1	275·6	..	..	418·4	298		
Oats (Algerian)—										
Pot 3	211	470·3	59·6	410·7	476·4	168·4	644·6	288	294	1,107
Pot 7	211	450·4	59·6	390·8	389·4	200·7	590·1	300		884
Wheat (Federation)—										
Pot 5	211	290·7	59·6	231·1	305·8	89·86	395·66	266	271·5	1,169
Pot 11	211	316·2	59·6	256·6	334·0	89·90	423·9	275		1,295
Peas (Dun)—										
Pot 6	196	292·7	54·2	238·5	277·0	139·5	406 5	266	257	77
Pot 10	196	310·0	54·2	255·8	265·5	200·6	466·1	248		57

TABLE SHOWING COMPARATIVE RAINFALL, EVAPORATION, MAXIMUM AIR TEMPERATURES, MEAN SOIL TEMPERATURES, AND WET BULB DEPRESSION AT RUTHERGLEN, FOR GROWING PERIOD, SEASONS 1914-1915.

Months.	Rainfall.		Evaporation.		Maximum Air Temperature.		Mean Soil Temperature, 6 inches.		Average Temperature at 9 a.m.				Wet Bulb	Depression.
									Dry bulb.		Wet bulb.			
	1914	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914	1915
	ins.	ins.	ins.	ins.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
June	0·60	3·61	1·05	1·17	57·2	53·8	46 1	47·4	36·5	42·4	36·0	41·4	0·5	1 0
July	0·88	1·98	1·08	1·96	53·9	55·1	45·0	47·7	37·3	43·4	36·5	42·5	0·8	0·9
August	0·45	2·91	1·77	1·58	59·8	55·7	47·5	47·1	38·4	44·0	37·7	42·6	0·7	1·4
September ..	0·47	2 37	3·74	2·67	68·3	61·3	53·8	52·3	44·1	48·1	42 6	46·0	1·5	2·1
October	..	2 81	7·28	3 54	82·7	65·6	69·2	56·4	56·5	53 2	51·3	48·6	5 2	4·6
November	1·06	0·18	9·36	6·21	86·1	74·6	77·9	64·2	68·4	57·8	61·5	52·5	6 9	5·3
Monthly average ..	0·58	2·31	4·14	2·85	68·0	61·0	56·6	52·2	46·8	48·1	44·2	45·6	2·6	2·5
Average for September, October and November	0·51	1·79	6·97	4·14	79·0	67·2	67·0	57·6	56·3	53·0	51·8	49·0	4 5	4·0
rage for October–November.. ..	0·53	1·50	8·32	4·87	84·4	70·1	73·5	60·3	62·45	55·5	56·4	50·55	6·05	4·95

The average water requirement for wheat, barley, oats, and peas, for the drought year 1914, was 576, as compared with a requirement of 273 for the same crops grown in 1915, *i.e.*, the Transpiration Ratio for 1914 was double that for 1915.

From the point of view of crop production, no two seasons could have shown greater contrasts. The 1914 season was the severest drought ever experienced in Victoria; the 1915 season, one of the most favorable cereal years, proved to be a year of record wheat production.

The meteorological summary for the growing period at Rutherglen shows the contrast in the seasons very clearly. The mean features of the 1914 season were the uniformly low rainfall (.57 inches per month), low air temperatures in the winter months, and exceedingly high air temperatures during October and November.

The wet bulb depression was small during the winter months, but very great during October and November. The evaporation from a free water surface was low during the winter months, but exceedingly high during October and November. On the other hand, during 1915, the rainfall was liberal and well distributed (2.31 inches per month), the air and soil temperatures showed more uniformity and far less range of variation than in 1914. The maximum air temperatures showed a range of 16.8° F. in 1915, as compared with a range of 31.8° F. in 1914.

Similarly, the range in the average dry-bulb readings for 1914 was 31.9° F., as compared with 15.4° F. in 1915.

Compared with 1914, the wet bulb depression during 1915 was greater during the winter and less during the spring.

Finally, the evaporation from a free water surface during the month of maximum transpiration was only 3.545 inches in 1915, as compared with 7.28 inches in 1914.

In other words, the evaporation during October of 1914 was 121 per cent. greater than in the corresponding month of 1915. For the period September to November, the total evaporation was 20.92 inches in 1914, as compared with 12.43 inches during the corresponding period of 1915.

From these results, it appears that a marked variation exists in the water requirement of cereals grown on the same farm from season to season, due to climatic differences, and that there is a fairly consistent relationship between the seasonal variation in the water requirement and the evaporation from a free water surface during the period of maximum transpiration.

(*To be continued.*)

SUCCESSFUL DAIRY FARMING.

WHAT DOES IT MEAN?

(Continued from page 177.)

By J. M. Kerr, Herd Registrar, Department of Agriculture.

The Homestead Site.

That less travelling may be imposed on the milking cows, it is worth something to have the homestead somewhere near the centre of the farm. A needlessly high position should be avoided, because not only is it a tax on the cows having to climb up to it twice a day, but it also entails a useless increase of haulage in harvesting operations.

Farm Steading.

The dwelling house is a matter for the owner's individual taste, and it hardly comes within our province to advise as to its features, except with regard to its position. It should occupy a more or less higher level than all the other farm buildings. The dwelling should face the farm approach, but it should never be placed too near the line of stable and cow-shed drainage. If practicable the front position should be reserved for it, so as not to necessitate going through the farm yard to reach its front door. But if the only fall is towards the farm approach, then the house is best placed alongside, on the same line of elevation as the farm buildings.

If a home can be given some architectural beauty, not necessarily costly, so much the better, for it is helpful to the occupants to be able to feel constant pride in their home. An unsightly dwelling is not conducive to a man's best efforts, and no doubt contributes to the prevailing tendency of farmer's sons to leave the paternal roof. No farmer, however poor, can afford to dispense entirely with the pleasures of the eye about his home. Mean homes, standing exposed and bare in the landscape, have a depressing effect on even a merely passing traveller; how much more must their effect react on those whose lives are inseparable from such environment.

With all the multifarious duties of a farm always ready to his hand, but ever uncompleted, the farmer too often persuades himself he has no time for such ornamentation as trees and shrubs provide. The mere planting of trees is a small matter—few men fail to do that some one or other; what is more commonly neglected is the longer operation of adequately protecting them from the farm animals, Make-shift guards are of no use, and the farmer who adopts them is right in saying he has not time for such work; they entail planting over and over again, which is pure waste of time. The only way to insure young trees ever reaching a size likely to add arboreal beauty to the home is to make a complete job of the protecting once and for all at the time of planting. And there are but few farms where this is not possible. In shelter rows along the dividing fences, or in well-protected clumps with all sides accessible, trees serve a purpose in keeping the animals warm, which purpose otherwise is served only at the expense of either the milk yield or the fodder consumed.

One need look for no better evidence of the thorough farmer than a wealth of well-placed trees, testimonies of both zeal and industriousness, and, perhaps, also business instinct. It is not suggested that more pressing farm operations should be subordinated to tree planting, but the owner of a treeless home might well give such work preference over the idle and aimless attendance at the local sales, which many indulge in.

The owner should not decide on the site of any building without an eye to the future. The position of any prospective building should be considered in relationship to others already existing, or which will eventually follow, and in relationship, also, to the scheme of drainage. In the interests of sanitation and convenience, the most suitable respective sites for the cow shed, silo, dairy, stable, feed barn, calf pen, manure pit, &c., should all be determined upon by the farmer before he begins to build any of them. He should try to avoid having to place drains where they will need to be frequently crossed by traffic. If this be unavoidable, they should be made strong enough at the crossing to withstand the damaging action of wheels. Later on he will probably add such useful buildings as implement shed, workshop, &c., the positions of which are less material.

The Cow Shed.

The object of a shed to cover the milking operations is mainly to protect those engaged in the work from extremes of weather. There is much to recommend open-air milking out on the grass, if milking could always be confined to favorable weather. But this operation must go on through all weather conditions, be they blizzard or brick-fielder, shower or shine, and the milker is not to be envied who has an ill-designed shed to work in. The design of the building should provide for effective exclusion of rain and strong winds, but the exclusion should only be carried so far as is necessary for the comfort of the workers.

In this climate a shed with its easterly side open has no superior, but this design is not practicable on a large scale. It can always be recommended where not more than a dozen bails are required, beyond that it is better to call a second side into requisition. It adds greatly to the convenience of the work, and often insures cleaner operations, if a bail can be provided for each cow in the herd, but it is not by any means necessary, for, if the floor is as good as it should be, a bail can be used to accommodate several cows in succession without undue fouling. For material there is no need to look further than weatherboard for the walls and galvanized iron for the roof.

The open design of shed, with yard behind the bails which is by far the most common in this State, should always be erected with its open side away from the weather—in northern districts this will mean the south-east, and in southerly districts, almost invariably the east. Thus a southern dairyman is fortunate if he can command an eastern slope for his shed, as this will permit of the most convenient yard arrangement, with drainage flowing away from, rather than towards the bails. A western slope is never so satisfactory, but if no other is available, the best arrangement is to still avail oneself of the natural fall by having the open side in front of the cows instead of behind them. As the cows must in this case be admitted through a wall it entails a door either in the rear or end wall of the shed.

The best arrangement for feeding is to have a feed-storage room along the front of the whole row, and feed the animals from the front. It is a common mistake with open sheds not to extend the roof far enough behind the bails; the benefit of a considerable floor space dry and free from mud has only to be experienced to be appreciated. Six feet is a most satisfactory distance, but certainly not less than four. Much annoyance is obviated by dispensing with supporting posts on the open side, using instead the cantilever principle. It may here be pointed out that it pays to let the roof of all farm buildings project 18 inches or so over the walled sides, thus shielding them from the wet, and effecting a great saving in the painting upkeep; in such case the spouting is attached to the end of the rafters. As convenience ceases when the number of bails in one row exceeds about fifteen, one would be well advised, when more are necessary, to adopt the double row of bails with each row of cows facing away from the other, allowing at least 8 feet between the opposing rear bail-posts. In this case a feed shed will be conveniently placed in front of one row, and the other row may be fed either from a feed gangway in front, or by wheeling a feed truck through the milking shed. If the herd be a large one it is well to have two feed mixing rooms, one in front of each row of cows.

In the interests of sanitation as well as comfort, one should always avoid making the yard on the high side. Neither should it be on the north or west, because the high winds common from these quarters are apt to whirl dry, powdery manure into the milking bails. There are only two aspects which the yard should ever occupy—easterly or southerly—and the whole lay-out of the steading may well be subordinated to this one possibility.

The Bails.

A bail width of 4 ft. 6 in. from centre to centre cannot be faulted for comfort, but in these times of expensive building material is rather a luxury. The commonest width is about 4 feet, and anything less is not recommended. Where leg-roping is practised the length of bail from front to back post should be from 5 to 6 feet, according to the size of the animals to be kept. With cows trained by kindness, leg-roping is rarely required, but, when practised, it should be done in a way that is not uncomfortable to the animal. Therefore the bail in which her neck is placed should not be set towards the left of the stall, but rather nearer the right, thus allowing room for her body against the rail.

The Floor.

Cow-shed floors should always be impervious to water, and for this purpose no floor is more serviceable than one of machine-made bricks, cement-grouted, or one of cement concrete, according to which is most conveniently available. The surface must be smooth for ease of cleaning. The floor in the actual bails should be given a fall of 2 inches from the manger in front to the gutter 6 feet distant at the rear. This gutter, 3 inches deep, and at least the width of a spade, should run along the whole row of bails and be continued outside the shed and on to the manure pit. The gutter should be close behind the cow, certainly not more distant than 6 feet from the front of the bail. In this position it receives the drainage early, before it has spread over and made slippery a wide surface, which is such a frequent cause of slipping accidents in milking sheds. It is rather an advantage to have the gutter not less than 9 inches wide, as the drainage is not then so likely to be obstructed by dung, and it also facilitates cleaning. No dairyman worth his salt needs to be told that the thorough removal of the manure twice daily is his bounden duty.

Feed Mangers.

If sufficient bails can be provided, the milking shed is the most convenient place for feeding, but the number should be sufficient to permit the cow time to consume all she requires before the necessity to release her. Wooden feed boxes are most commonly used, and if kept cleaned answer all practical purposes. They should be carried up well in front to prevent spillings from the mouth being wasted, and should possess partitions to insure each animal getting its own. Galvanized iron makes a more sanitary manger, especially if hinged on its front edge to permit of its being inverted for cleaning purposes, but in practice, especially if ensilage is used, it is expensive, owing to the corrosive action of this acidulous material on the metal.

Some space should be reserved in every milking-shed for a bench on which the carrying pails may stand out of reach of manure and mud contamination while waiting in the shed to be filled. The milk should not be allowed to remain for any length of time in the atmosphere of the cow shed. If for city supply, it should straightway be carried to the cooling room (which may be constructed similarly to a dairy) and tipped through an effective strainer into a vat from which it is allowed to flow over a cooler through which cool water is flowing to the cooler's full capacity. Where cleanliness is properly understood, muslin or butter cloth can be recommended for straining purposes. Naturally the cooler the water one can command, the more effectively the cooler does its work. Water from a galvanized tank may serve in winter but becomes too warm in summer to be of much use. An underground well gives the best results, but requires to be of good dimensions to remain cool in summer. A good, deep underground tank will enable one to reduce the milk to a temperature of about 65°, or, perhaps, 60°, by the ordinary cooling process on the farm.

Treatment of Cream.

If butter-fat is to be sold it is usually sent from the farm as cream. With this method of disposal, cooling of the milk is not necessary, as the separator skims better with the milk warm as it comes from the udder. If the milk is allowed to become cooler than this it should be heated again to at least 100°, its temperature should be again raised for separating, otherwise valuable butter-fat is likely to escape into the skim milk. This will also occur if the separator handle is turned at less than the specified speed. The fresh cream should never be run into that already on hand, but should be run into a separate vessel standing in cool water, or over one of the specially designed small cream coolers, to cool it down as it comes from the machine. After the temperature has been thus reduced it may be mixed with the older cream and thoroughly stirred with a well-tinned metal stirrer right to the bottom to insure uniform ripening. Such a stirrer may remain in the can till the can is full. A wooden instrument is not likely to be kept sanitary unless in exceptional hands, and rarely is one found that is not more or less contaminated.

Cream should reach the factory when not more than two days old. In warm weather, daily delivery should be the rule. While on the farm the cream should be kept in a cool dairy, and a clean muslin placed over the vessel to exclude flies while admitting air. The attention necessary for preservation of good quality must commence from the time the milk leaves the udder. Deterioration begins from this moment. In nature this is obviated by the offspring receiving its mother's milk direct from the teat without possibility of intervening contamination. Where any considerable interval must elapse before milk can be used, provision must be made against the rapid increase of germ life which, if not checked, brings about souring and eventual putrefaction. Every man handling a delicate article like milk is better fitted for the work by understanding what it is which brings about the changes which occur in milk after withdrawal from udder.

As a food, milk more nearly approaches perfection than any other single substance. Now there are three things essential to germs, viz., food, warmth, and moisture, and the three are nowhere more suitably associated than in warm milk. Nothing suits the lactic acid bacillus better for food than the natural milk sugar, and the curd of milk is all that putrefactive germs require; in fact, warm milk is their paradise. Once they reach it they require but one thing—a continuance of a favorable temperature—to multiply and multiply unto its eventual total decomposition. The lactic acid germ, feeding on the milk sugar, produces lactic acid which, when it arrives at sufficient quantity, acts as would vinegar, or any other acid to cause curdling. The temperature which these germs mostly enjoy is about blood heat—anything higher or lower steadies their activities. As the rate of deterioration of milk depends on the number and activity of the germs it contains, and as germ development is checked by low temperature, the earlier the cooling is done the better. Cooling the milk is the dairyman's second line of defence only—the first line is cleanliness. Cooling is merely an attempt at checking an evil already present, but cleanliness is in the nature of preventing the access of the evil, which is better.

Although no place is free from dust, and no dust is free from germs of some kind, it is not so much ordinary atmospheric dust which contaminates milk, but rather dirt from the cow herself, the milker's hands, or imperfectly washed utensils. Some few and comparatively harmless germs will invariably gain access from the air of the cleanest cow shed—to exclude them completely is impossible—but the dairyman should realize that every particle of foreign matter which enters the milk, be it from a dirty udder, an unwashed hand, a splash of cow dung, or a common fly, is a source of corruption which had better be dealt with instanter. It may be taken for granted that every particle of dirt entering the milk is germ bearing, and constitutes a focus of infection from which rapid multiplication will immediately begin. Every reasonable effort should be made to prevent access of dirt to the milk at every stage of the operations. Prior to milking, udders and teats should be at least wiped with a clean, damp cloth that has been washed under a tap and wrung out between each using. Any long hair around the teats should be clipped. The milker should wash his hands (preferably under a tap) before milking each cow. There should be as little as possible contact of milk with the finger. If splashes of manure or dirt from the animal's body or hoofs should foul the bucket, prompt and proper action should be taken to prevent the contamination extending further. Flies should be regarded with abhorrence, and no practicable means neglected to exclude them from the pails. A dairyman with a proper sense of his responsibility will not leave visible impurities for the strainer to remove. The strainer of fine brass wire gauze in which a clean muslin cloth has been inserted is an additional necessary safeguard. But unless used by one understanding the importance of cleanliness, the cloth adjunct may do more harm than good. To clean cloth which has been in contact with milk there should be a first vigorous washing in luke-warm water (not hotter), then wrung out dry as hands can do it, then well soused in boiling water for some minutes, and again well wrung out, and spread to its fullest on a line in clean, airy surroundings to dry. A cloth, especially a damp one, should never be left bunched up after washing. This will defeat the whole object of the cleansing. Poor-keeping quality of milk, cream, butter, and cheese is almost always due to dirty methods in the course of handling. There is no more common cause than unclean utensils; that is, utensils so rust-pitted that they cannot be cleansed, or perhaps utensils in good repair, but which have not been washed as they should be. Neglect to cleanse the separator thoroughly is another frequent cause of trouble. Not to dismantle it and wash the various parts after every using is a hopeless and disgraceful practice. A well-tinned surface on utensils is essential. When the tin has worn so as to expose the iron, the utensil should be discarded, because not only is a rusty surface uncleanable, but iron rust imparts a specific objectionable flavour to the contents.

It is of no use any one imagining a utensil is satisfactorily washed that has not had a final scalding; steam is better still, but no form of severe heat should be applied until all trace of milk has first been removed by the vigorous use of a brush and tepid water only. Every corner and seam must be reached by the brush, so that all adhering matter may be removed, after which the utensil should be allowed to remain for a few minutes in boiling water. Even more effective than boiling water as a sterilizer, if steam under pressure is available, is a small steam pipe coming up through a bench or table, over which the vessel can be inverted and steam admitted for a few minutes. If subjected sufficiently to either boiling water or steam, the utensil will require nothing further than to be inverted on a clean rack, with narrow slats of metal or wood, until again required. Wiping with a cloth after sterilizing is harmful; it serves only to undo the good effect of the heat. If sufficient heat has been applied, the warmth acquired by the metal will disperse all moisture in a few minutes, making wiping altogether uncalled for. The slats of the rack should be narrow to permit free circulation of air within the inverted utensil. Narrow-neck milk cans dry better if, after being placed upside down to drain for a few minutes, they are again stood upright. Of course, a draining rack should be clean itself and situated in clean airy surroundings. A little washing soda added to the wash water (both the cold and hot) occasionally, will assist to make the cleansing more thorough. Utensils when not in use should always be kept inverted to better exclude dust.

The Dairy.

The dairy should be conveniently situated to the cow shed without being unnecessarily close. After what the effect of cool temperatures on the milk has been shown to be, the object of designing for coolness will be recognised. Whether the dairy is to be used for mere hasty treatment of milk before despatch to market, or for cream storage, or for butter making, it should be designed with the special object of defeating the germ. In fact, all a dairy needs to be is some practical means of protecting dairy products from the changes which the ubiquitous micro-organism is ever ready to work in it. It is again all a matter of cleanliness, for dirt and germs mean the same thing.

The dairy walls and ceiling should be of good height and of smooth surface. The floor should be smooth in surface and of hard material, impervious all over and graded just sufficiently towards the exit (the door opening may be availed of for this) to insure drainage gravitating out to an impervious gutter leading well away to a fenced-in area. Abundant fresh air must be admitted, but all inlet vents should be designed to check its velocity, so that any impurities it bears in the way of dust particles may be precipitated before reaching the inside. The angle at conjunction of walls and floor should be rounded off. Outlet vents should be in the ceiling, and may be straight up through the roof, but inlet vents should take the form of the letter V carried tubularly 2 feet underground before rising to admit the air low down in the wall. The outer tube should be 6 inches above-ground at the entrance, 4 inches in diameter, water-proofed with cement, and capped so to exclude rainfall and flies. Dairies with the floor much below the ground are too difficult of ventilation to be recommended. It is always well to project the roofing well over the walls; this will give shade from sun and protection from damp. Although the dairy must be well lighted, strong sunlight is damaging to dairy produce in more ways than one. Adjustable shutters should be fitted so that any excess of light may be excluded. A white interior is always desirable, and limewash is recommended.

Stable.

The dimensions of this will, of course, depend on the number of horses to be accommodated. It should contain a stall not less than 5 ft. 6 in. wide for each animal. Sufficient room should be allowed behind the stalls to enable the horse to back out comfortably without knocking against the harness which usually occupies pegs specially provided on the wall. While being weather proof in all seasons, the building should also be airy and well lighted. It is an advantage if hinged or otherwise adjustable shutters can be provided for use in times of winter cold and summer heat. The entrance should not be less than 4 feet wide and 7 feet high. A double door is best—the lower one 4 feet high and the upper one 3 feet, either of which may be opened separately. In summer time additional ventilation may be gained by leaving the upper door open. It is also advisable to have the door on the lee side of the building which, almost invariably, is the east.

As these remarks are intended mainly for dairymen, it is the sanitary aspect of the stabling accommodation which most needs stressing. No stable can be sanitary unless the floor is of suitable material. A floor which cuts up into a puddle or a depression beneath the horse and does not permit of ready escape of liquid drainage, is always objectionable. Although excellent from a purely sanitary aspect, concrete or brick is very hard and cold for a stall floor unless abundant bedding is available. Probably, from an all-round point of view, a good wooden floor, if properly laid, is preferable to either. If well-seasoned sawn 3-inch by 2-inch hardwood be solidly bedded into a well-rammed loam foundation, each piece being tarred with hot coal tar before being tamped and forced closely into place, and laid with a fall of 1 in 50 rearwards, it forms a floor sufficiently sanitary and yet comfortable for the animals. It will be improved by being swept over with hot coal tar, and top dressed with sand. An impervious gutter to which the animal urine will gravitate should be provided along the rear of all the stalls, and given a fall sufficient to quickly convey the liquid outside and well away from the buildings, preferably to a cesspit which, when practicable, should be provided to collect all liquid manure right beside the larger pit for solid manure, over which the liquid can then be regularly distributed, as will be described further on.

Some space must be reserved for feed storage which usually consists of a built-in chaff bin holding several days' food, and a smaller one for oats or bran to cover a similar period.

Calf Pen.

When skim milk is retained on the farm some shelter provision will require to be made for calves or pigs. Not much is required for the former, as they are better out in the open after they are a week old. It is necessary to enclose them when they are removed from the mother, better at some distance, because the bellowing of the calf has a disturbing influence on the dam. While housed calves need a dry, clean floor. They are best in a shed with three sides completely closed to eliminate draughts. The unclosed side may open out into a small run so that the youngsters may frolic at will during fine weather. The calf-run to which they may soon be removed should have good, soft pasture, natural drainage, and protection by trees, a closely-boarded fence or buildings from the coldest weather quarters. If one can subdivide the run into several smaller ones a continuity of the most suitable pastures will be better insured.

Pig Sties.

The pigs' quarters need to be some distance from the dwelling and dairy, &c. It is well to place them, if practicable, below the level of cow shed, or, at least, where their drainage will tend away from the other buildings. The pigs should never in any circumstances be allowed to roam over the farm yard. Their quarters should be kept clean, and all the manure saved for the growth of fodder crops. These remarks apply equally to fowls.

The Implement Shed.

It is poor policy to leave implements and vehicles out in the sun and rain. A rain-proof roof is all that is required. If a shed on a large scale is required, it is advisable to have access to it from all sides, and also to have the supporting posts strong so that there may be fewer of them to interfere with the moving of the implements.

The Silo.

The only way to insure succulent food the year round is to keep a silo in use. This structure should be placed handy to the cow shed, should be airtight and never less than 25 feet in depth. Its diameter should not be less than 10 feet or more than 18 feet, according to the size of dairy herd to be maintained. It may be of wooden staves throughout, of wood and galvanized iron, of cement-laid bricks, or of concrete. All are satisfactory if properly constructed, the latter two being practically everlasting. A full silo is the best insurance against the occasional dry season which may otherwise so easily catch one unprepared. It should be of adequate strength to resist the internal pressure; its inside surface must be smooth, so as to offer as little resistance as possible to the contents settling. Once well placed in a silo, fodder is safe for an indefinite period, defying both mice and fire.

Manure Storage.

Although in this country farmers generally have not yet come to an adequate appreciation of farm-yard manure, no advice would bear criticism which attempted to justify the prevailing wasteful treatment of it. It is good land, indeed, which farm-yard manure does not improve, and give an increase of value well beyond the cost of application.

To insure its maximum effect it should be used before it becomes stale. It has but a weak hold on its most valuable ingredients and is soon deprived of them, if left exposed to either sun or rain. Its nitrogenous ingredient in the form of carbonate of ammonia is its most valuable constituent, and the farmer who allows its valuable ammonia to float away in the wind day after day is parting with an asset which would cost more to replace than he would care to pay. Access of air is the cause of the ammonia thus escaping, and the way to prevent it doing so is to keep the heap damp. If proper provision is made, there should be nearly sufficient liquid manure to use for this purpose. Liquid and solid manure from the animals should both be conserved, for, if anything, the liquid manure is the more valuable.

All solid manure which can be collected from cow shed and yard stable, pig sty and fowlyard, should be deposited in a pit on a lower level at a sanitary distance yet conveniently situated to cow shed, stable, and sties. If the contour permits of these buildings being built in a line in that order, it is a good arrangement. An open drain of tiles, brick, or concrete, with sides high enough to exclude surface drainage, should receive the drainage from all three places and discharge into an impervious pit sufficiently large to hold at least two days' liquid drainage. This pit should adjoin the much larger one for solid manure, which should also be of impervious material (a plain clay bottom serves well), and about 2 feet below ground level. Each day as fresh manure is brought down, the liquid manure from the one pit can be dipped out and thrown over the surface of the dung in the contiguous pit, thus dampening the contents sufficiently to retard wasteful decomposition.

Drainage from a manure heap always constitutes a leakage of plant food, one of its virtues for manurial purposes, being the solubility of its ingredients. For this reason a roof to exclude the rain is advisable. It should throw the water clear of both pits and be high enough not to interfere with the emptying. The earlier the manure reaches, and is ploughed into the land, the better. It certainly pays to get it out every fortnight, however small the quantity, or else whenever a full drayload has accumulated.

It is foolish for a farmer to be out of a job while there is manure to be distributed. He is no agriculturist who does not appreciate this fact. Any quantity up to forty dray loads to the acre may be applied, but even one-tenth of this will cause conspicuous superiority of plant growth. The loads should be tipped at regular intervals not further apart than twice the distance a man can pitch with a fork. Uniform distribution is most important, otherwise crops will be patchy, and, perhaps, rank where application is excessive. On large farms the mechanical spreader drawn by horses will do the work more effectively, as well as more cheaply, than hand labour.

Subdivision.

In valuing a farm one cannot afford to ignore either the convenience or the condition of the fences. When cropping is practised to the extent that it should be, secure fences are a necessity. The wise dairyman will see to it that his cows are able to obtain a fill without extensive foraging. A cow's digestive apparatus is designed for long pasture, and a full bite of grass is the dairy-cow's right, as long as there is growth. This is not likely to obtain except the farm is divided up into small paddocks which can be spelled in rotation. It is always good practice to give cows frequent changes of pasture, in the interests, not only of the cows, but of the pasture as well.

The root system of any plant is in proportion to its foliage, and prevention of leaf development has a corresponding effect on the roots. If all land were extremely rich, and the rainfall always ample, a very few roots would suffice to serve the plants' needs, but conditions on all farms are removed more or less from this ideal. By leaf development alone are the roots enabled to extend, and the only way to insure this is to give the plants occasional respite from grazing and trampling. The good which the pasture will derive will always be reflected in the animals.

Perfect assimilation of eaten food can occur only in a resting animal. The cow obtaining her fill with a minimum of effort, and with leisure to digest it, has a great advantage over the animal which has to perform hard labour for every mouthful. One well-known characteristic of a good milking animal—the ability to consume large quantities of feed—is nullified when she has to move her whole body over an excessive area to acquire it. What, under right circumstances, would be a recommendation is turned into a handicap. The daily capacity of a cow's stomach is about 100 pounds of grass. If the pasture is so reduced that 8 acres is required to furnish this amount, a journey of over 20 miles is imposed on the animal. The class of dairy cow one must have to-day should not be condemned to as many chains. If she can obtain a sufficiency in her own length so much the better for the milk yield. As contributors to this end nothing better can be suggested than small paddocks treated with regular dressings of farmyard manure and lime, or mineral fertilizers.

RICHNESS AND COLOUR IN MILK.

Some researches that have been made indicate that the natural yellow colour in milk, cream, and butter is due to a yellow pigment called "carotin," which appears to pass from the food into the milk, and to be associated with the fat globules. The colour of the milk, therefore, is due primarily to the amount of this substance present in the food, except in so far as certain breeds, notably the Guernsey and the Jersey possess to an exceptional degree the power of extracting carotin from foods and storing it up in their tissues, and are thus enabled to maintain the colour of their milk for a considerable time on diets poor in carotin.

The colouring matter is most abundant in the green parts of the plants, its specific yellow colour being hidden by the green colouring pigment. The following foods are richest in carotin, and, therefore, give milk, cream, and butter of the desired yellow colour:—Green pasture, all forage crops, hay made with the least possible bleaching, carrots and other yellow roots, and new silage. It is notably lacking in hay that has lost its green colour in making, in straw, and in all cakes, meals and offals; also silage appears to lose its carotin in the course of the chemical changes which take place in the silo. There may be some slight differences in the colouring effect of the different cakes and meals, and, according to English Jersey owners, oats and bran will give a paler butter than linseed and cotton cakes, maize and bean meal. Cabbage and other similar plants also give a much better colour than mangolds.

It is a common belief that a yellow colour and a high percentage of fat in milk are necessarily associated. This is usually the case in Jersey and Guernsey milk, but it is not a necessary relationship. Cows of other breeds sometimes give rich milk of a poor colour; all cows give milk of a yellow colour after calving, when the percentage of fat is usually low, and turning out to pasture in spring gives a deeper colour and a decrease in the percentage of fat.—(*The Dairy.*)

DOOKIE CROP AND FALLOW COMPETITION.

Report of Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer.

The Crop Competition is no new thing at Dookie, but this is the first occasion on which fallows there have also been submitted to the judge. The innovation bears witness to the general interest which is being awakened in the Goulburn Valley in improved methods of cultivation, and in particular to the belief in and around Dookie that possibly the friable soils of the district can be worked under the same system as that practised in the Wimmera. The opportunity was therefore afforded the judge of making, in addition to the inspection of numerous wheat crops, a critical examination of about a dozen fallows representative of the various soil types.

Soils and Climate.

The most striking features of the Dookie landscape are the steep masses of decomposing igneous rock which tower above the town on all sides; that, and the rich colour of the cultivated land, red on the slopes of the hills and black on the flats. The red soil is a free-working clay loam, and the black a rich friable clay loam resembling very much the best Wimmera land; if anything it looks richer and capable of growing even heavier crops than Wimmera soil. The rainfall averages about 21 inches annually. It is therefore ample for wheat growing. In the year just passed the precipitation was much below normal, but certainly not below the quantity upon which heavy crops may be raised. The incidence was such that the autumn and winter were dry. The spring, however, was satisfactory, though short. In all 10 96 inches of rain fell at Dookie for the year. At Salisbury, near Nhill in the Wimmera, slightly less rain was registered—10.07 inches—yet the general average of the crops seen at Salisbury was markedly above those at Dookie. What is the explanation? Possibly the distribution of the rain were more favorable in the Wimmera. The records of the rainfall registered at Messrs. Bennett Bros., Dookie, and Mr. W. E. Dahlenburg's, Salisbury, however, furnish evidence on that point.

	Dookie (Goulburn Valley). in	Salisbury (Wimmera) in
January	Nil	.54
February	.97	.10
March	.37	Nil
April	Nil	.25
May	1.11	2.55
June	1.10	1.33
July	1.71	.99
August	1.32	1.08
September	2.89	2.06
October	1.49	1.10
November	Nil	.07
December	Nil	Nil
	10.96	10.07

A Dookie Homestead

Comparing the tables, it is evident that there is little to choose between the seasons in the two districts. Salisbury had good falls in May, but July was a dry month, and it was followed by a dry spring. On the other hand, May at Dookie was somewhat dry, but the spring was fairly good. September in particular was an excellent month. The soils in both districts appear to be equally good. Is it possible, then, that the explanation is in the difference between the cropping methods practised? At Dookie, so far, there is little or no summer-fallowing done, though much of the land lends itself admirably for the purpose. Again, the fallows are not given the same systematic cultivation, though that is on the increase; nor is the cultivation done with the same kind of implements. The quantity of seed used per acre is below that used in the Wimmera, and so is the quantity of fertilizer. Is there not a possibility, at any rate in part, that the yields of the crops in the two districts reflect the differences in method?

Wimmera methods, of course, are not likely to be applicable generally to all types of soil found at Dookie; but there would appear to be little doubt that they will suit the red soils on the hills which flank the township and at Mt. Major and on the associated black flats. But the grey clay loams and the poor rising land need other treatment. The last two types are liable to set down like cement after rain, if cultivated to excess.

The 1922 Competition.

Nine crops, each of 25 acres, and eleven fallows of similar area were submitted to the judge. The crops, after personal inspection, were judged on the scale of points outlined below. Fallows were tested with a spade, and depth of mulch and moisture content, &c., estimated.

RESULTS—BEST WHEAT CROP—25 ACRES.

Mr. P. J. Ryan was awarded 92 marks and first prize for a heavy crop of Major wheat. The yields should be at least 12½ bags to the acre The 25 acres was the heaviest portion of a paddock of black soil The crop was dense and regular throughout. It was well headed, but a few strangers were noticed. No weeds were present save an odd saffron thistle. The crop was a remarkably fine one considering the low rainfall. The land upon which it was grown received the following treatment.—Ploughed from 3 to 4 inches deep in June and July; in September spring-toothed and in October skim-ploughed. After harvest the fallow was harrowed following the February rain, disced in March, harrowed in April, spring-toothed in May, and then sown and harrowed 60 lbs. of seed and 60 lbs. of superposphate were applied per acre.

It will be noticed that the fallow was ploughed fairly shallowly, and early in the season Subsequently it received thorough cultivation. In particular is the stroke of the harrows after the February rain thought to have played an important part in the yield. As far as possible the working of the land while in a dry condition was avoided

The crop awarded second prize was 25 acres of Minister grown by Messrs. Bennett Bros.; 86 points were scored. The yield would not apparently be so heavy as the same competitor's Major, but the crop was more true to type and quite free from weeds. The wheat was well-headed, but a trifle thin. It was grown on red land which received the following treatment:—Fallowed in August to from 4 to 4½ inches deep, harrowed three times before harvest, spring-toothed in September and again in October. After harvest it was spring-toothed up and harrowed, and sown about mid-day with 80 lbs. of seed and 106 lbs. of superphosphate per acre.

The Major wheat was sown early in May with 72 lbs. of seed and 106 lbs. of superphosphate. The fallow had been prepared as for the Minister.

The liberal cultivation given the fallow will be noted, as well as the heavy dressing of seed and manure. These are factors which must have contributed to the success of the crop. It is emphasized that the soil on which the crop was grown is red land, while that of the winner is black.

Mr Chas Wolstencroft's paddock of Joffre wheat scored 83 points The yield was, however, not as high as some other crops; nevertheless, the wheat was very true to type, free from weeds and from any disease whatever. In addition it was short, level and even, though thin The fallowing was done late—October—and subsequently well worked. The seeding was made in mid-June with 60 lbs. of seed and 90 lbs. of superphosphate.

Mr. R. Fish's paddock of Yanward should yield well. The wheat was fairly pure, but some ball smut was present. A paddock of Joffre shown by the same competitor had been sown early on a black flat. Weeds were bad in the crop, and points were deducted accordingly.

BEST WHEAT CROP—25 ACRES.

Details of Points Awarded.

Competitor	Variety	Yield.	Trueness to Type	Absence of Weeds	Absence of Disease	Evenness.	Total
Possible Points		**35**	**20**	**15**	**15**	**15**	**100**
P. J. Ryan	Major	35	17	13	13	14	92
Bennett Bros.	Minister	26	18	15	14	13	86
Chas. Wolstencroft	Joffre	20	19	14	15	15	83
R. Fish	Yanward	28	18	12	10	14	82
Bennett Bros.	Major	27	16	10	12	14	79
E. Petschack	Federation	22	14	13	13	14	76
Ludeman Bros.	Minister	17	16	15	14	14	76
F. A. Knox	Minister	23	17	10	11	13	74
R. Fish	Joffre	21	18	5	8	9	61

NOTE.—The points for yield do not represent bushels per acre, but the differences between them do. The winning crop was estimated to yield more than 35 bushels per acre.

RESULTS—FALLOWS

Mr. J. Knox, of Cosgrove, was awarded 97 points and first place for a fine paddock of summer-fallow on black soil, at Cosgrove. The maximum quantity of moisture had been conserved by careful mulching. The seed-bed was firmly consolidated and moist enough at a depth of a few inches to be moulded with the hand. The mulch, *i.e.*, loose soil on top, was fine in texture and mellow in appearance, and about two and a half inches deep. A point was deducted for somewhat uneven displacement of the top soil, caused by the scarifier ridging slightly. The paddock received treatment as follows:—Ploughed in March to between 5 and 6 inches deep; then scarified in July, again in September, again in August, and again early in November Each scarifying was made shallowly to a depth just sufficiently to cut weeds, and always while the soil was moist. In summer-fallowing and in the subsequent cultivation Mr. Knox closely adhered to what he had read of Wimmera practice. The scarifier, though not of Wimmera make, did work closely resembling one. In summer-fallowing in the Wimmera it is not the practice to plough so deeply. From 3½ to 4 inches is considered enough. If Mr. Knox will seed this paddock with from 75 to 80 lbs. of seed and 112 lbs. of superposphate late in June, he should harvest a bumper crop.

Messrs. Bennett Bros. No. 1 entry of red fallow was placed second with 92 points. The moisture content was high, though not so good as that of the winner. The cultivation, however, was not so regular throughout. The land was ploughed in August to from 4 to 4½ inches deep, then harrowed, re-harrowed in October, and subsequently a part was spring-toothed.

Messrs. Bennett. Bros. No. 2 entry was summer-fallowed land. The part submitted for inspection, however, was somewhat lower in moisture content than might have been expected.

Ninety-one points were scored by Mr. D. McGuiness for 25 acres of summer-fallow on a black flat 100 acres in extent. The moisture content was good, but the mulch rather rougher than is desirable. The land was skim-ploughed in February to three inches, skim-ploughed again in August, and then harrowed twice.

Mr. P. J Ryan's fallow on black soil was also one of those showing good moisture content; the cultivation, however, had not been regularly performed. It was winter-fallowed in July to three inches, harrowed in August and again in December, spring-toothed toward the end of October and then harrowed.

Best Fallow—25 Acres.

Details of Points Awarded.

Competitor	Soil Type	Moisture.	Mulch.	Weeds	Cultivation.	Total
Possible points		**25**	**25**	**25**	**25**	**100**
J. Knox	Black clay loam	25	24	24	24	97
Bennett Bros.	Red loam (No. 1)	22	23	24	23	92
D. McGuiness	Black clay loam	23	21	24	23	91
P. J. Ryan	Black clay loam	23	22	24	21	90
Bennett Bros	Black clay loam (No. 2)	21	23	24	22	90
T. J. Ryan	Red loam	19	24	23	24	90
F. Petschack	Sandy loam	21	24	23	21	89
J. Panter	Silty loam	20	23	23	22	8[illegible]
Bennett Bros.	Red loam (No. 3)	20	20	23	23	86
J. Cummins	Loam	20	20	22	22	84
F. A. Knox	Red loam	18	19	23	20	80

New Methods for Dookie.

To those who know the Wimmera, the prices asked for the rich black flats at Dookie appear to be surprisingly low. Land similarly situated and of much the same appearance would command nearly double the price in the Wimmera. What is the explanation? The answer is that the yield per acre is higher in the Wimmera.

A question that any Dookie farmers who have black land are asking themselves is, would the adoption of Wimmera practices result in improved crop yields? The answer is that there does not seem any reason why it should not. But, of course, the proof of the pudding is in the eating. No one will know until a trial has been made. Already, go-ahead farmers like Mr. J. Knox and others are attempting to put it to a practical test. Next year the competition should afford an opportunity for comparison of crops grown on land treated in the Wimmera way with crops grown on land treated the Dookie way. But the Wimmera method involves the use of the Wimmera scarifiers in place of the skim-plough So far there are only one or two implements of the type mentioned in the district.

Cropping Black Land.

Friable black soils of the type found in the Wimmera and at Dookie have certain characteristics in common. They are very sticky while wet, they naturally grow a rank crop of weeds and wild oats, and often it is difficult to get the seed-bed thoroughly consolidated, conditions which practical men know go hand in hand with "take all." In the Wimmera these difficulties are overcome by the use of well-designed implements, and by fallowing according to a special method. The black land is usually best ploughed shallowly, that is to from 3½ to 4½ inches deep with a prong mouldboard plough. This does not stick up so badly as the ordinary mouldboards which of course are never "clean." Preferably the original ploughing is done in February, March or April, while the land is dry In this condition the going is easy, and excellent work can be done. This is called summer-fallowing. The shallow ploughing permits of more effective consolidation. Weeds will germinate well and grow vigorously on the summer fallow. They must be "sheeped" down, or else it may be necessary to replough the paddock. In July the paddock should be scarified to a depth of about 3 inches. Any winter-fallowed land is ploughed at this time to 3½ to 4 inches deep.

Spring-toothing the fallow—Messrs. Bennett Bros., Dookie.

As a rule, the fallows of both types may be treated alike afterwards. The harrows follow, and then as weeds make vigorous growth, the scarifier in September and possibly again in October is used Each stroke should be followed with the harrows, and the September scarifying should cut to a depth of only about 2½ inches so that a firm bottom is left. On no account should the scarifier be permitted to tear into the bottom. As far as possible each cultivation should be across the direction of the last. Later on, whenever rain falls, the paddock should be harrowed, if other duties permit. No work, other than the original summer-fallowing, should be done while the land is dry and dusty.

In the autumn the rubbish is scarified and the paddock harrowed; this is followed by a further scarifying of rubbish and harrowing before the drill. In this way some eight to fourteen or fifteen workings may be given the land. The effect is to clean the soil of weeds, to liberate the maximum supplies of plant food, and to consolidate the seed bed thoroughly.

Land of this class grows rank dirty crops if sown early. It would be worth while testing portion of a fallow prepared as outlined above with a late-sown crop—say July-sown. Black soil can hardly be put in too wet, so there is little to fear from a germination point of view if this course is adopted. If 75 lbs. of seed are used, with 112 lbs. superphosphate per acre, the crop will be short and clean and should yield heavily.

For the red land, though not nearly so sticky, somewhat similar treatment should suffice, though it may be sown earlier.

Treatment for the more refractory soils of the district has been exhaustively dealt with in the report furnished to the Shepparton Agricultural Society.

WEEDS AND THEIR ERADICATION.

(Continued from p. 189.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Stinking Sheep Weed, *Gilia squarrosa,* H. and A. Family: *Polemoniaceæ.*

This evil-smelling annual (Fig. 59) belongs to the Phlox family. It is a low-growing plant, usually under a foot in height, but sometimes reaching even 2 feet. About twenty species of the genus Gilia have been described. All are natives of America, where some of them are cultivated as garden plants. The species *squarrosa* first came into prominence here some twenty-one years ago.

As a rule it consists of several many-branched stems with alternate leaves; these are pinnatifid (cut into lobes nearly half-way to the midrib) and the segments are deeply incised and furnished with pricking points, the latter making it a most unpleasant weed to handle, especially after it has become dry.

Stinking Gilia has small, pale-blue flowers contained in dense heads of a burr-like appearance. The entire plant is covered with hairs, and is sticky-glandular. On account of its fetid odour, it has received several names indicative of its character, as, for instance, Skunkweed, and Stinkweed.

Stock will not eat it, and if it be harvested with hay it will spoil the hay by imparting to it an offensive flavour This led to its being proclaimed a noxious weed throughout the whole State.

The best method of control is either to hoe the plants before they have seeded or to keep them cut frequently during the growing season The seeds of the Gilia are said to be short lived.

Merian's Bugle Lily, *Watsonia Meriana,* Mill. Family: *Iridaceæ.*

In the *Victorian Naturalist* 1907, Vol. XXIV., page 15, Professor Ewart gives a list of "Unrecorded Introduced Plants," among which this Watsonia is listed as a garden escape and rapidly establishing itself in the Mornington District. Since that was written it has established itself over very large areas of land.

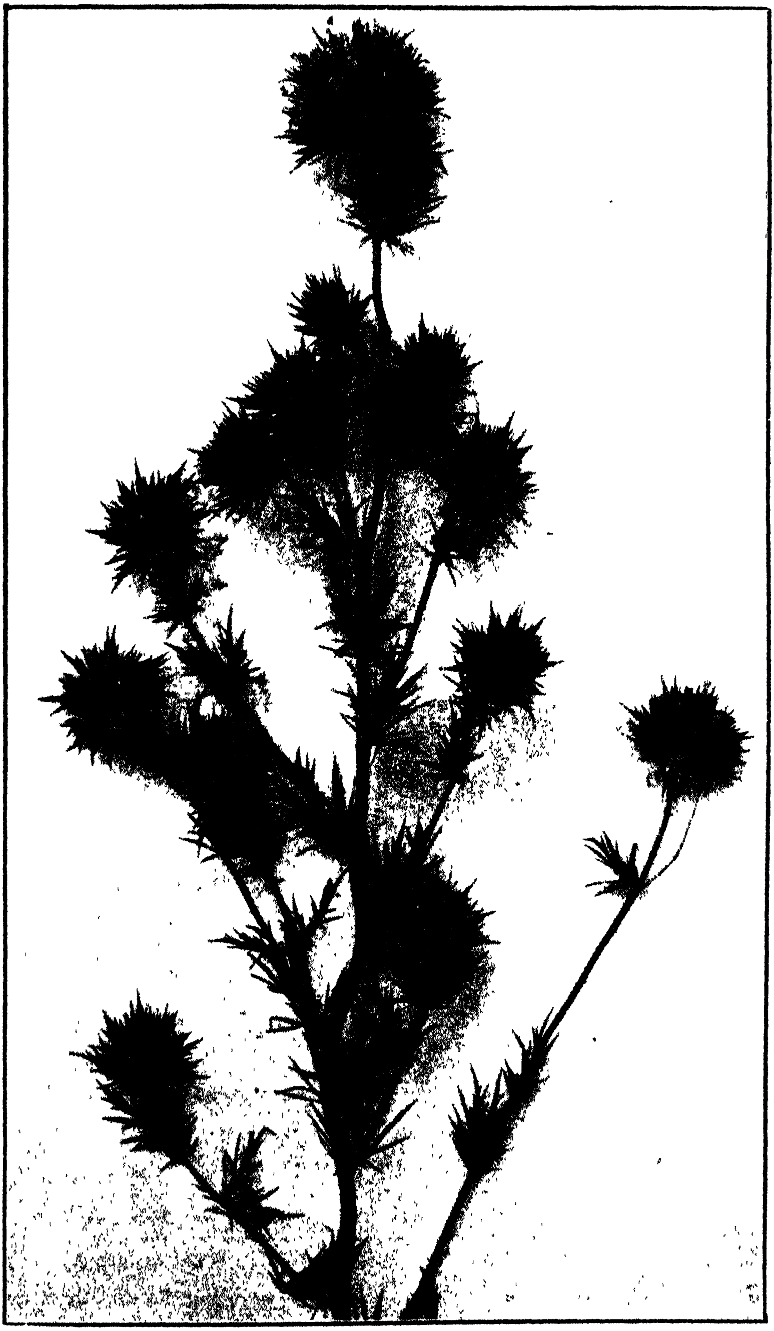


Fig. 59.—Spray of Stinking Sheep Weed, *Gilia squarrosa*, H. and A. (Natural size.)

The plant (Figs. 60 and 61) can easily be recognised by its stiff broad leaves, its globular corm, and where land is heavily infested, its rose-red blossoms become during the flowering season a very distinctive feature of the landscape.

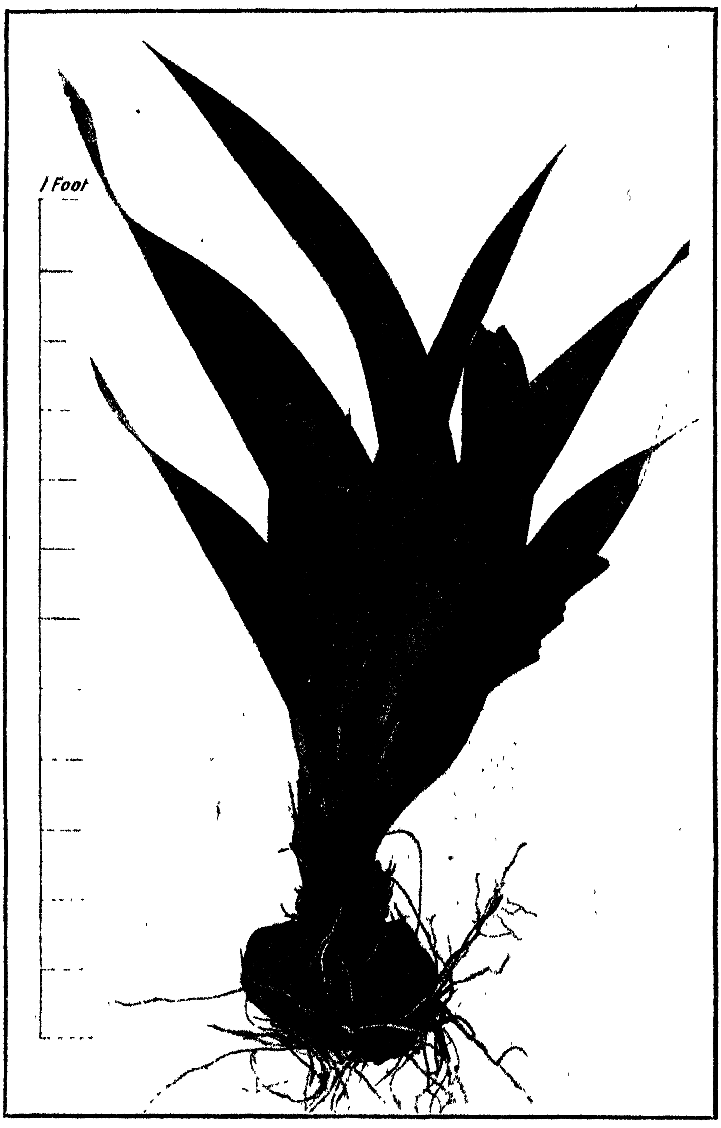


Fig 60.—Merian's Bugle Lily, *Watsonia Meriana*, **Mill.**

It is a perennial bulbous plant, and is a native of South Africa, and affords another instance of the geniality of our climate in favoring the spread of alien weeds.

This Watsonia favours land that is very moist during the spring months, and in such situations will take entire possession of the ground to the exclusion of other vegetation. As it cannot be hand-pulled on account of its firm grip of the soil, the plants should be dug or mattocked out before they flower, and then collected and burnt. Cultivations should be frequent, so as to bring the corms to the surface, and thus dry out those that have started into growth. It may take some years to rid the ground entirely of this pest.

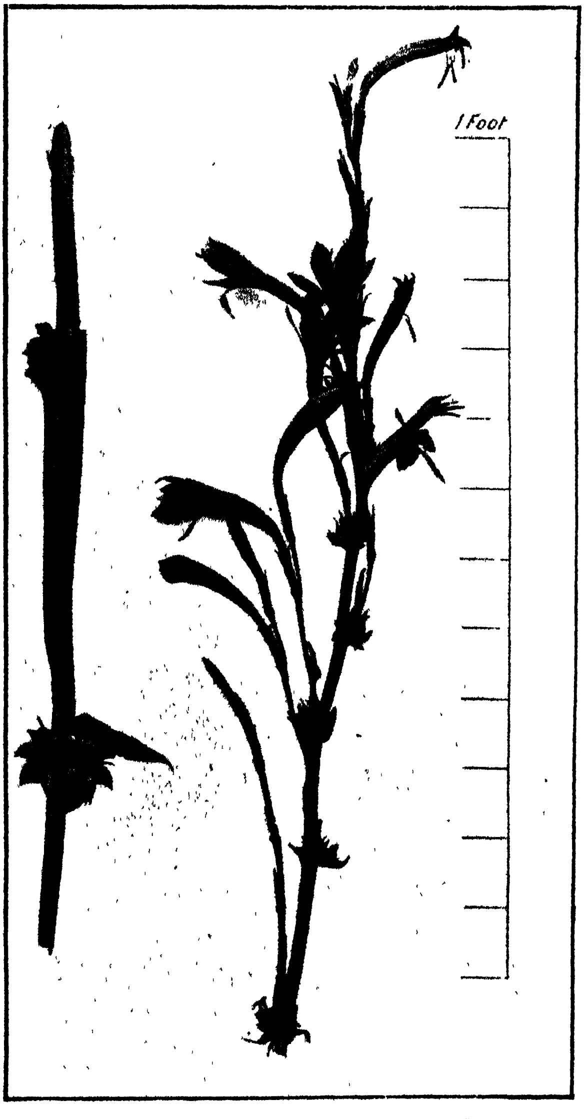


Fig. 61.—Merian's Bugle Lily—flower and bulbils on stems.

Merian's Bugle Lily is proclaimed a weed throughout the whole State of Victoria.

(*To be continued.*)

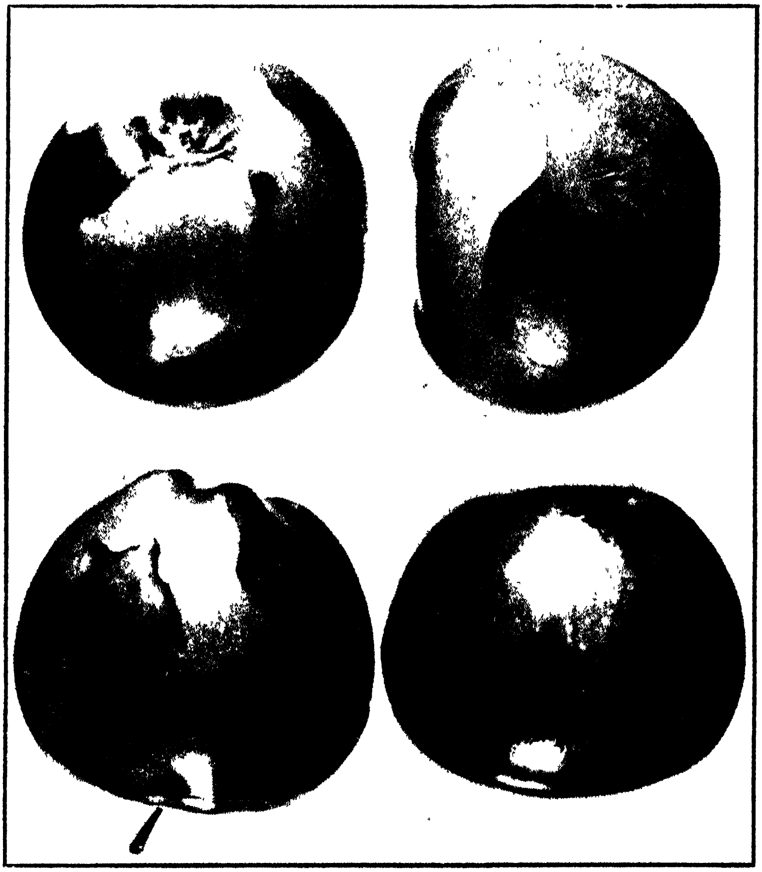
EXPERIMENTS IN THE STORAGE OF FRUITS.

(Continued from page 186.)

By D. B. Adam, B. Ag. Sc., Department of Agriculture.

APPLES.

It will be convenient to consider the question of the storage of apples in a manner similar to that used when the question of pear storage was discussed. (*Journal of Agriculture,* March, 1923.) There it was shown pears were limited in their storage life by two types of condition arising. These were:—(1) Physiological disturbances, where the cause is inherent in the fruit itself, when it is under particular conditions of storage; (2) mould decay, where the cause is a definite isolable organism of a fungal character.



Apple Scald.

Samples of different varieties after exposure in a container to malonic ester vapour.

The skin blemishes, scald and Jonathan spot, and flesh collapse are examples of physiological disturbances in apples.

The development of scald in cool storage will be considered first.

After long storage, scald is easily the most serious defect in many varieties of apples. The first sign of the disease is recognised by a brown coloration of the surface cells in characteristic, sharply defined areas. This affection, at first quite shallow, extends into the underlying tissues, and may, in time, involve the whole of the apple. The different varieties of apples vary in their susceptibility to scald; the character of the injury produced also varies in the different varieties.

Scald develops rapidly on the removal of affected fruit from store.

Experimental results will be given, and an interpretation of these will be sought. Special attention has, as a result of the experiments outlined below, been directed to the theory of Brooks, Cooley, and Fisher.*

Experiments with Rome Beauty Apples.

In the table given below the fruit referred to was examined after nine months' storage, the examination taking place immediately after its removal from store.

Table I. shows the effect of aeration and temperature on the development of scald in immature (see Note (*a*)) Rome Beauty apples from Drouin. The fruit was packed in bushel cases, the sides of which were lined with paper; the fruit was not wrapped.

TABLE I.

Chamber No	Temp. Deg F	Refrig System	No Apples Showing— Slight Scald	No Apples Showing— Bad Scald	No. Sound.	Percentage Sound	Grade, &c
1	32	Direct Expansion and Air Circulation	16	38	90	67	3″
2	32	Direct Expansion .	10	34	90	67	3″
26	32	Air Circulation.. ..	4	32	56	62	3″ (See Note (*b*))
3	34	Direct Expansion ..	18	33	14	22	3″
5	34	Direct Expansion and Air Circulation	0	1	59	98	3″ (See Note (*c*))
6	37	Direct Expansion and Air Circulation	11	20	18	36	3½″
7	37	Direct Expansion ..	0	15	42	73	3″
8	37	Air Circulation ..	5	17	21	49	3½″ (See Note (*d*))

Note (*a*).—The maturity of any fruit is a quality that it is difficult to describe accurately. In the present instance the fruit was green, quite devoid of "colour"; the flesh was slightly greenish colour, and distinctly acid to the taste.

(*b*) Chamber No. 26 is a commercial chamber. Here, though the temperature is 32° F., the volume of air passing per cubic foot of storage space necessary to maintain this temperature is not nearly as great as it would be if the chamber were of the dimensions of the experimental series.

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* *Jour. Agr. Res.*, Vol. XVI., p. 195, vol. XVIII., p 211.

(*c*) This fruit was placed immediately underneath the inlet duct, cold air at 30-32° F. passing directly through the case of fruit.

(*d*) Owing to the comparatively high temperature of this chamber, there is practically no cold air passing through it during the winter months.

Whilst these results are not entirely uniform, they demonstrate that—

(1) Immature fruit is susceptible to scald.
(2) Scald is more severe at higher temperatures than at low temperatures.
(3) Efficient ventilation practically eliminates scald. (Note excellent results obtained in Chamber 5.)
(4) When the conditions favouring scald production are pronounced, as in the case given, the circulation necessary to cool the chambers in the air circulating system chambers has little effect on scald development (see later tables—Rymers).

Some Rome Beauty apples off thirty-year-old trees, from Beechworth (a warm district) did not show any trace of scald when stored under the different conditions of refrigeration and temperatures that were used. These apples were well coloured, and would be classed as mature; the ground colour was light green, the flesh had just a tinge of greenness, and the seeds were dark brown. Another consignment of Rome Beauty apples from Geelong (a cooler district) was also practically free from scald. For the variety, Rome Beauty, the apples were of medium to poor colour, though in respect to taste, colour of flesh and seeds, would have been classed as mature.

These results show the one variety—Rome Beauty—varying considerably in its susceptibility, and this susceptibility is proportional to its maturity.

Experiments with Rymer Apples.

The results from the storage of Rymer apples, grown at Harcourt and Ringwood respectively have been compared. These results are given below in Table II. (*a*) Harcourt fruit; (*b*) Ringwood fruit.

TABLE II.

Chamber	Refrig. System	Sound	Scald	Scald.	Grad
No. 1	Direct Expansion and Air Circulation			Per cent	
	(*a*)	62	38	38	3"
	(*b*)	187	1	1	2½"
No. 2	Direct Expansion				
	(*a*) .. .	49	48	50	3"
	(*b*)	102	7	7	2¾"
No. 26	Air Circulation				
	(*a*)	38	90	70	2¾"
	(*b*)	63	31	34	2¾"

As previously noted, chamber No. 26 is a commercial size chamber where the amount of the circulation cannot be compared with that in the chambers of the experimental series. Both samples of apples were picked off old trees. The Harcourt lot was not wrapped, and was forwarded on the 4th April; that from Ringwood was wrapped, and forwarded on the 25th April.

The results again show the importance of maturity in scald development. From the extent of the injury in the Ringwood fruit, which was small, and the percentage affected, it has been assumed that the conditions for scald development are less favorable here than in the instance of the Rome Beauty apples previously referred to. A comparison of the results obtained in chambers 1 and 2 shows the alleviating effect of good circulation on scald development. On the other hand, the large "air circulation chamber" gives consistently poor results. It, however, would be useless to compare results from this chamber with those of the experimental series, when the problem is apparently dependent rather on relative air movements than on actual temperature. Again, it is clear that where the conditions for scald development are favorable, the amount of circulation that the engineer has control of has little effect on scald development. This statement, of course, refers to the chamber as a whole, and not to any special position such as immediately under the discharge duct.

Another case of Rymers from Drouin showed 70 per cent. scald when stored at 32° F. In examining these apples, it was noted that the slightly "coloured" apples were the most severely scalded. Apples which were quite green showed a much smaller percentage of scald, whilst the fully matured apples were most subject to it. Brooks, Cooley, and Fisher were the first to observe the greater freedom of immature apples from scald as compared with mature fruit (*loc. cit.*).

Experiments with Winter Majetin and Stone Pippin Apples.

Some Winter Majetin apples stored at 32° F. were very badly scalded after five months' storage. This fruit was packed in the standard "dump" bushel case, the inside of which was lined with a double layer of newspaper. The fruit was not wrapped. These apples, from trees thirty-four years old, were leaf-green in colour, though classed as fairly mature by the grower. The scald was equally bad under each system of refrigeration. The odour of apples, generally considered to be due to a mixture of esters exhaled by the fruit, was very strong.

Stone Pippin apples are well known to "brown" after a period in storage—generally in the months of October and November. If removed from store to a warmer place, they rapidly develop typical scald injury.

Several samples of Stone Pippins from Pakenham, Harcourt, and elsewhere, stored in different chambers under commercial conditions, as well as in the experimental chambers, developed scald on removal from store during the first week in November. Here also there was a very distinct apple odour.

Neither the scald injury nor the apple odour was as pronounced as in the cases of Winter Majetin apples.

Experiments with Jonathans.

The use of tissue papers, soaked in odourless and tasteless mineral oil, as a wrapping-paper has been recommended by American workers for the prevention of scald.

The Jonathan apple is notorious as the most susceptible variety of apple to scald. Several consignments of Jonathans were received from different districts. Some of each of these lots were wrapped in oiled papers; none was scalded. However, as no more than 1 or 2 per cent. were scalded in any one case, the results are inconclusive. In explanation it may be noted that as the experiments were not commenced until the Jonathan season was nearly over, all such apples received were naturally quite mature, and, as shown before, mature apples are not so liable to scald as immature ones.

Cause of Scald.

Many theories have been advanced as to the cause of scald in apples. Some local current ideas may be quoted:—"Too low a temperature"; "too sudden cooling"; "cold air blowing on the fruit"; "too high humidity"; "excess of carbon dioxide," &c. Each of these theories, except the last one, which was not tested, have failed to explain fully the facts of the experiment as presented.

Brooks and his collaborators consider that scald is produced by gases other than carbon dioxide exhaled by the fruit. These gases are of the nature of a mixture of esters. A form of scald of a similar appearance to cold storage scald may be produced by placing the fruit in a closed container with the ester amyl acetate. A similar experiment by the writer using ethyl malonate, or malonic ester, resulted in the production of typical scald injury on a large number of varieties. (See illustration on page 234.)

In examining these artificially scalded apples, it was noticed that the maturer samples were scalded worse than the less mature samples. The varieties themselves also varied greatly in their resistance to scald injury. After six days' exposure to the air, Granny Smith, Dunn's, and Yappeen seedling apples did not show any sign of scald, whereas Jonathan, Five Crown, and Rome Beauty apples, held in the same vessel at the same time, where badly scalded. These resistances compare very favorably with results in scald incidence obtained in cool storage practice.

Again, the character of the scald injury is dependent on the variety of the apple. Apples, it is known, vary in the quality or texture of their flesh, some being known as soft varieties, for example, the Jonathan; others as hard varieties, *e.g.*, Stone Pippin. Considering both this fact and the nature of the probable causal agent, we may expect, for various reasons, that the form of injury would vary with these varieties. The differences are found, in actual practice, both with natural and artificially scalded apples. Scald injury in a Jonathan apple is at first quite "shallow," but soon develops—extending into the flesh, producing slightly sunken areas. The depth to which it penetrates, of course, varies according to the time when it is examined. In Stone Pippin apples, on the other hand, penetration only extends up to about ⅛ of an inch, even after long periods of storage. The affected areas do not sink appreciably. Such varieties, when first examined, have a brown mark on the skin, which is quite firm, and only "skin deep."

These experiments are merely preliminary in nature, but do indicate lines for future work, particularly the nature and quantitative relations of the gases exhaled during ripening. More extensive experiments in the use of oiled papers are also required. This mode of limiting the losses from scald seems to be more desirable than an attempt to control circulation in actual practice—especially when the conditions for scald production are favorable.

Jonathan Spot.

This disease is so named on account of its nature, and frequent occurrence on Jonathan apples—particularly after they have been in cool store for some time. It should not be confounded with Bitter Pit, from which it is quite distinct. In appearance, the diseased areas are circular brown patches from ⅛ to ¼ of an inch in diameter; the surface colour-bearing cells are affected. In the centre of each affected area is a darker portion, the lenticel, from which the disease seems to have spread. At times, the spotting acquires a form peculiarly like a bacterial infection, the area immediately around the lenticel remains green, being surrounded with a more or less regular brown ring. The affected areas of cells collapse. Gases like ammonia and formaldehyde will also produce injury on apples of a similar appearance to Jonathan Spot (Norton).*

No organisms have as yet been definitely associated with Jonathan Spot. A species of alternaria has been isolated from a varying number of spots by Cook and Martin.† The presence of this fungus, however, is possibly the result of an after infection. Jonathan Spot also occurs on the variety Scarlet Non Pariel. Indeed, with the apples used in the experiment, Scarlet Non Pariel apples were worse affected than the Jonathans. The disease is also found on the Rome Beauty, though there to a much more limited extent.

Jonathan Spot varies in its incidence with the different stages of maturity of the apple. The conditions favouring spot development appear to be different from those favouring development of scald.

A comparison has been made between the respective development of spot on Jonathan apples stored at 32° F. under two different systems of refrigeration. The apples were grown in different districts, and were of different maturity. The maturity was estimated by the average general tone of the green ground colour and the colour of the flesh. In the table given hereunder, the consignments are arranged in descending order of maturity. The lot from Ringwood though the least mature of those considered, was certainly not immature. With the exception of the Harcourt consignment, where there was a negligible amount of scald (3 per cent.), no scald developed on any of the apples. The results are set out in Table III.:—

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* Phytopath III., 1913, p. 99.

† Phytopath IV., 1914, p. 102

TABLE III.

Chamber	Refrig System	Sound	Slightly Spotted	Badly Spotted.	Spot	Remarks
1	Direct Expansion and Air Circulation—				Per cent	
	(*a*)	91	13	2	9	Harcourt, well coloured
	(*b*) .. .	122	52	7	21	Drouin, medium colour
	(*c*) . .	149	20	7	10	Drouin, medium to good colour
	(*d*)	185	23	0	6	Ringwood, good colour
2	Direct Expansion—					
	(*a*) .. .	53	42	13	40	See Note (*a*) page 235
	(*b*) .. .	84	24	4	16	See Note (*b*) page 235
	(*c*) . .	185	17	8	8	See Note (*c*) page 236
	(*d*) . ..	172	1	4	3	See Note (*d*) page 236

N.B.—The percentage of spot is a calculation of the ratio of "badly spotted" to sound apples. For this purpose, two "slightly spotted" apples have been considered as equivalent to one "badly spotted" apple. A "slightly spotted apple" has four or less spots.

The nature and mode of estimating the extent of spot has possibly given rise to the irregular results given above. These results, however, demonstrate a correlation between maturity and spot development. The mature apples were spotted worse than the less mature.

Table IV. gives a comparison between the percentages of Spot on Jonathan apples stored under different conditions of temperature and refrigeration.

The apples are the same samples as referred to in Table III.—Drouin (*a*) and Ringwood.

TABLE IV.

Chamber No	Temp.	Refrigeration	Drouin.	Ringwood.
1	32° F	Direct Expansion and Air Circulation .	10	2
2	32° ,,	Direct Expansion	8	3
3	34° ,,	Direct Expansion	5	10
4	34° ,,	Air Circulation	18	1
5	34° ,,	Direct Expansion and Air Circulation ..	14	No figures

From these results there appears to be no apparent connexion between—

(*a*) Temperature;
(*b*) The refrigeration system;

and the development of the Jonathan Spot.

Two consignments of Rome Beauty apples were received from Drouin—the first (*a*) on 13th April, 1922; the second (*b*) on 4th May, 1922, three weeks later.

The results of the comparison of these consignments is given in Table V.:—

TABLE V.

Chamber	Refrig System	Temp	Spotted	Not Spotted.	Spotted
					per cent.
No. 4 (*a*)	Air Circulation ..	34° F.	0	75	0
No. 4 (*b*)	Air Circulation . ..	34°	30	126	20

Neither consignment was scalded.

The results show a close relation between maturity and Spot development.

Some Scarlet Non Pariel apples, on examination in November, were found to be badly spotted. Stored at 32° F. in chambers 1 and 2, they showed from 50 to 90 per cent. Spot. These apples were fully matured, grown at Beechworth, forwarded and placed in store on 26th April, 1922.

The Cause of Jonathan Spot.

No specific cause for the development of Jonathan Spot can be cited. Attempts to isolate fungi on various culture media have not been successful. Its occurrence to a fairly uniform extent under the different systems of refrigeration employed does not agree with the theory that ammonia is a causal agent, since in some of the systems employed the presence of ammonia even in traces is practically impossible. Its relation to maturity has, however, an important practical bearing. The orchardist must study maturity closely. If he picks too early scald develops; if he allows the fruit to remain too long on the trees, Spot will develop in store. While Jonathan Spot is the lesser of two evils, it has been shown that if an apple is picked at a particular stage in its maturity, neither scald nor Spot will develop appreciably.

(*To be continued.*)

CUTTING OF CALIFORNIAN THISTLE.

In view of certain statements that Californian thistle is checked far more effectively when cut in flower than is the case with earlier cutting, the New Zealand Department of Agriculture recently carried out tests on selected areas in Canterbury. Cutting at the respective stages was done last season, and the results, after the lapse of a year, have now been duly observed and recorded. Neither area gives any indication that late cutting results in the reduction of the thistles, there being no apparent difference between the late and early cut patches. Taking everything into consideration, including the obvious risk of allowing the thistle to flower, the Department cannot indorse the method of late cutting.—*New Zealand Journal of Agriculture, March,* 1923.

DISEASES OF THE COTTON PLANT.

By C. C. Brittlebank, Plant Pathologist, and D. B. Adam, B. Ag. Sc.

The cotton plant, *Gossypium* sp., is liable to a variety of serious diseases. Some are caused by fungi, the spores of which are carried on the lint remaining on the seed after ginning. Black rot or cotton wilt, caused by the fungus, *Fusarium vasinfectum* E.F.S., and Anthracnose of the boll and stem, caused by the fungus, *Glomerella gossypii* (Southworth) Edg., are examples of two serious diseases which are spread by this method.

Neither of these diseases has been reported as occurring in Australia. There, however, is a possibility of their being found in Queensland, where cotton has been grown for about fifty years. As no effort to prevent the introduction of disease in the original seed samples was made, that State must be considered a possible source of infection. All seed brought from there should, therefore, be subjected to the same disinfection and treatment as any imported from overseas. On account of the dryness of the adhering lint, it is difficult to effectively soak the usual sample of cotton seed in any disinfectant. It is necessary to remove the lint. The concentrated sulphuric acid method of treatment is an efficient and cheap way of delinting cotton seed. (J. F. Duggar, Alabama, Expr. Sta. Rec. XXV. 2 p. 132.) The seed is placed in a wooden or earthenware vessel, and then covered with commercial sulphuric acid for from ten to fifteen minutes, being stirred constantly with a wooden ladle. The seed can be removed in an earthenware vessel with a sieve bottom. The sulphuric acid may be used for treating several lots of seeds. The treated seed is washed in running water for twenty minutes, and allowed to drain. For complete disinfection, the seeds may then be placed in corrosive sublimate (1-1000) for fifteen minutes, and at the end of that time allowed to dry.

Experiments in the use of this process have been made in the laboratory of the Department of Agriculture. Some have been designed to test the effect of the treatment on the germination of the seed and the condition of the young plants. Other experiments have been carried out to test the effect of immersion in sulphuric acid for varying periods:—

(1) THE EFFECT ON GERMINATION.

Two samples of 100 seeds each were taken. One was treated for fifteen minutes with sulphuric acid and then washed for twenty minutes and germinated. The other sample was not treated. Of the treated seed 88 per cent. has germinated in three days, and in four days 93 per cent., which was the total germination. The growth was clean and vigorous. Of the untreated seed 86 per cent. germinated in four days and 90 per cent. in six days, which also was the total germination. The growth of these plants was not as vigorous as that of those from the treated seed.

Many treated seeds were grown in pots. Of the plants to be used for inoculation experiments, none failed to germinate; all gave clean, healthy, vigorous plants. Some of the plants grown from untreated seed were sickly and apparently affected with disease. A suspension obtained by soaking untreated seed was used to inoculate agar plates. Among the numerous fungi found, a fusarium was isolated. This was used for inoculation experiments, details of which are given below:—

(*a*) Some clean cotton seeds were planted. Eleven days after they showed above ground they were infected with spores from an agar culture placed on the soil around each plant. In four days all the plants were affected.

(*b*) Soil was sterilized in an autoclave at 110° C. for two hours. Cotton seed was treated with sulphuric acid for fifteen minutes, washed for twenty minutes, and sown in four pots with this sterilized soil.

Five seeds were sown in each pot.

	Treatment	Number germinating.	Remarks
(*a*) 1	Seeds infected from culture .	. .	
2	,, ,, ,, .	2	Spores formed on primary leaves
(*b*) 3	Soil infected with spores	1	
4	,, ,, ,,	1	

The exact species of fusarium has not been definitely fixed. In severe cases it has entirely prevented the germination of the seed.

(2) THE EFFECT OF VARYING THE TIME OF IMMERSION IN SULPHURIC ACID.

Small bottles, each containing 100 seeds, with sufficient sulphuric acid to cover them, were used. After the period of immersion and washing the seeds were placed in damp blotting paper and incubated at 75° F. The first examination took place four days afterwards, the final examination two days later. The results are given below:—

Period of immersion.	First germination.	Final germination.	Remarks.
Minutes.	Percentage.	Percentage	
0	86	90	
15	88	93	These plants were more vigorous and cleaner than those from untreated seed
20	86	90	
25	84	87	
30	92	94	
35	80	85	
40	84	86	
45	92	95	
60	83	86	
75	88	91	
90	91	93	
120	88	89	
240	90	94	

From this table it may be seen that the prolonged immersion of four hours did not affect the germinating capacity. Some seedlings from treated seed have been grown in pots, and have given perfectly healthy plants and bolls. To test whether seeds could be killed with sulphuric acid some seeds were left in concentrated acid for twenty and forty hours, and subsequently washed. Germinations of 91 and 92 per cent. respectively were obtained. With the former a good, clean, healthy growth was obtained. In the second case many of the young plants were mal-formed. The sulphuric acid had decomposed the pericarp, and had begun to attack the cotyledons, or subsequent primary leaves. It is doubtful whether any of these plants would have grown much further than the seedling stage. From the data given, there seems to be little danger from too long immersion within reasonable limits.

It was thought advisable to test the effect of treating seed with sulphuric acid for varying periods, then washing, drying, and allowing it to stand for a week, and this was done. The results obtained are given below. Seeds germinated at 75° F.:—

Time immersed	Germination percentage.
15 minutes	94
30 ,,	92
45 ,,	94
60 ,,	90
Check	90

This shows that a delay of one week after immersion before planting has no effect on germination.

When sulphuric acid and water are mixed, heat is rapidly developed. Under some conditions this may do so with explosive activity; hence sulphuric acid must always be used with great care. After treatment with sulphuric acid and subsequent draining, the seed should be placed in a large quantity of running water. An experiment was conducted by adding a small quantity of water to treated seed; the temperature rose to 180°, but with the addition of more water, it soon fell. Subsequent experiment showed that seed held in hot water at 180° F. for five minutes, failed absolutely to germinate. At 160° F. for five minutes of two samples 46 and 41 per cent. respectively germinated. The necessity for care in handling sulphuric acid cannot be too strongly impressed upon those unacquainted with its strength. If it comes in contact with the hands, it will burn them, and any splashed on clothes will damage them.

SUMMARY.

1. The spores of many serious diseases are borne in the lint attached to the seed.
2. The lint is most conveniently removed with sulphuric acid.
3. The necessity for treatment of all imported samples is shown by the isolation of a pathogenic fusarium from an imported cotton-seed sample. Its pathogenicity has been demonstrated.
4. Immersion for reasonable periods up to four hours has no effect on the capacity of the seed to germinate.
5. Finally, the seed, after immersion in sulphuric acid, should be washed in a large quantity of running water.

SCHOOL CALF CLUB.

COMPETITION AT YINNAR SOUTH.

By W. J. Yuill, Dairy Supervisor.

The small dairying district of Yinnar South is situated at the foot of some of the wildest hill country in South Gippsland. Though the population there is very small, it has been sufficient from which to elect an enthusiastic State School committee, which deserves the credit for introducing into Victoria a modified form of calf club, a movement popular in many other countries As the average attendance of scholars at the school is only twenty-five, many of whom live some distance from the school, the enthusiasm of the committee is all the more to be admired

"Favour" with her proud owners. This calf was awarded highest aggregate number of points in the competition, and thus won the ribbon.

A pure-bred-calf club was organized at Geelong last year, when calves were donated to the club by various breeders throughout the State. It was not possible, however, for the Yinnar South committee to secure pure-bred animals of similar age and sex; therefore the committee took what was available—grade Jersey calves.

The object of the calf club is to provide for children living in rural districts a form of pleasure of an educational nature, which will link up school work with the home industry. As the duty of calf-feeding is often allotted to children on a farm, it is hoped the club competitions will be the means of increasing the interest of children in their work, to the mutual advantage of child and calf. The excellent work of the

Bird League may be mentioned. In a single generation the spirit of indifference to our native birds has been displaced by an interest and pleasure in them.

It is safe to assume that when the interest of children is aroused in calf feeding, it will be easier to teach them that a baby calf, like other babies, needs care, and that it must be given good food in proper quantities. They will learn that the common cause of indigestion, which brings about most of the calf's ailments, undermining its constitution and stunting its growth, is improper food, and it cannot be too strongly urged upon both child and adult that during the first weeks of a calf's life, good feeding is imperative.

Winner of prize in Best Type Section—Calf owned by Reggie Holt. In the background is Eric Holt in charge of his calf.

The Competition.

In the Yinnar South competition feeding was regulated by the following few simple rules:—

(1) All calves to be of similar breeding, age and sex.

(2) Children's parents to see that the feeding with new milk is restricted to fourteen days.

(3) New and skim milk in equal quantities to be fed for the next fourteen days.

(4) After four weeks calves to be given as much skim milk as they will drink, with half a pound of prepared calf mixture. A cup of lime water to be added to feed daily.

In addition, it was arranged that the age and weight of each calf were to be recorded at a Field Day on the 23rd August, and on this day each calf was tattooed on the ear with its owner's club number.

Prizes were offered for the greatest increase of weight, for the best led calf, and for the best type of calf, and a special prize was given for the calf securing the highest aggregate number of points in the competition.

Calves were entered by fourteen children, some families having double entries.

Judging day was held on the 13th December, when the competitors again brought their calves to the weighing steward in order that the animal showing the greatest increase in weight might be found. Later, the children led the calves into the ring, where the judging of the best type and the best fed calf took place. Anxiety was expressed in many faces, and if the truth be told, also in the faces of parents. There was a good attendance of supporters, and advice was freely given to the young competitors as they entered the ring. Some of the calves were a credit to their juvenile exhibitors. They were well groomed for the occasion, and showed every appearance of having been well cared for at all times.

The Awards.

The coveted prize for the calf securing the highest aggregate number of points in the competition was awarded to the exhibit of the four Holt children It also was placed first in the section for greatest increase in weight Although rather heavy in the body, the result of too liberal feeding, this calf was a fine specimen.

The winner of the prize for the best type exhibit was the entry of Reggie Holt. It was a very fine calf, well-grown and sleek without any suspicion of grossness, though a little more feeding would have improved it.

For the best-led calf the first prize went to Norman Brewster and the second to Oswald Brewster. Several of the children experienced difficulty in leading their exhibits—a trouble due perhaps to stage fright, as much as to insufficient training.

An enlarged photograph of the first Field Day group was awarded to the owner of the best type calf, and in order that every competitor might receive some reward, it was decided to pool the whole of the money given for prizes and divide it amongst the competitors according to the percentage of aggregate points allotted to each animal entered for the competition.

Value of Such Competitions.

As a means of providing pleasure and interest and education in one branch of farm work, the calf club competitions cannot be too highly recommended to State school committees. They will undoubtedly improve the children's understanding of farm animals, and by comparing calves on judging day the young competitors will learn to observe the many points of difference which make animal study one of so much interest. In addition it should improve the relationship between the school authorities and the parents.

The committee and teacher of the Yinnar South School must be warmly congratulated on the success of their project, and it is to be hoped that the movement will spread throughout the State.

Yinnar South Calf Club Competition.

Name of Competitor.	Club Number.	Age of Calf at beginning of competition.	Weight of Calf on first field day.	Weight of Calf on final day	Increase of weight during competition.	Points awarded in Section.	Best type Calf (possible points 20).	Best bred Calf Section (possible points 20).	Aggregate number of points (possible points 60).
		Days	lbs	lbs.	lbs.				
Syd, Muriel, Rene, and Nell Holt .	7	19	87	263¼	174¼	20	15½	13	48½
Reg. and Gladys Deppler .. .	8	21	84	256	171½	17	14	15	46
Nancy Moore	14	2	45	204	159½	14	17	14	45
Daisy and Sylvie Deppler	3	8	71	245	168	15½	15	12	42½
Reggie Holt . ..	10	29	98	259	161½	15	19	7	41
Eric Holt .. .	11	26	88	242	154½	13	15	11	39
Annie and Arthur Turnbull .	1	6	67½	175	107½	10	12	15½	37½
Oswald Brewster	12	30	95	168	73	9	11	17	37
Reg. and Keith Nadenbouch ..	2	13	87½	238¾	151¼	12	14	11	37
Norman Brewster ..	13	28	90	146½	56	7	10	19	36
Jack, Dick, and Joyce Gilbert .	4	18	84½	217¾	133¼	11	13	7	31
Alex. Miller . .	6	28	65	152¾	87¾	10	10	7	27
Arch and Ostle Deppler . ..	5	8	78½	Calf could not be caught					
Freddie Peddle	9	20	84¼	Left district					

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923

Description of Fertilizer.	Brand	Nitrogen.				Phosphoric Acid.				Potash.	Price asked for the fertilizer per ton.	Where Obtainable
		As Blood.	As Blood and Bone.	As Bone and Flesh.	As Total.	As Water Soluble.	As Citrate Soluble.	As Citrate In-soluble.	As Total.			
Mainly Nitrogenous, readily soluble		%	%	%	%	%	%	%	%	%	£ s. d.	
Blood ..	Cockbill's Blood Manure	8·50			8 50			1 00	1 00		9 0 0	W. and J. Cockbill, jun., trading as J. Cockbill, 407 Post Office-place, Melbourne
Blood Manure ..	Champion .	12 25			12 25			2 00	2 00		Not retailed	John Cooke and Co Pty. Ltd., 534 Collins-street, Melbourne
Dried Blood	S C. over D.B	10 00			10 00			1 50	1·50		12 0 0	Sims Cooper and Co. Aust Pty. Ltd., Melbourne
,, ,, ..	P. . .	9 00			9 00			0 50	0·50		15 10 0	H. C. Pannifex, 26 Market-street, Melbourne
,, ,, .	Nifex	7·50			7·50			1 00	1·00	0 25	9 19 0	,, ,, ,,
Mainly Phosphatic, readily soluble.												
Superphosphate	W.M L in diamond Standard Super					17·00	0 50	0 50	18 00		5 1 1	Wallaroo-Mount Lyell Fertilizers Ltd., Adelaide, South Australia
	W M.L. in diamond High Grade Super.					0 50	20 50	0 50	21 50		5 13 7	,, ,, ,,
,, ,,	Top Brand Mineral Super					17·00	0 50	0 50	18 00		5 2 1	The Adelaide Chemical and Fertilizers Coy. Ltd., Currie-street, Adelaide, South Australia
,, ,,	Top Brand Special High Grade Super.					20 50	0 50	0 50	21·50		5 14 7	,, ,, ,,

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1923—*continued.*

Description of Fertilizer.	Brand	Nitrogen.				Phosphoric Acid.				Potash.	Price asked for the Fertilizer per ton	Where Obtainable
		As Blood.	As Blood and Bone.	As Bone and Flesh.	As Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	As Total			
		%	%	%	%	%	%	%	%	%	£ s d	
Containing Nitrogen and Phosphoric Acid—Moderately soluble.												
Blood and Bone	S.C. over B.B	..	5 50	.	5 50		6 00	11 00	17 00		8 10 0	Sims Cooper and Co. Pty. Ltd., Melbourne
,, ,	Cockbill's	.	5 50	..	5·50	.	4·00	10 00	14·00		11 0 0	W. and J. Cockbill, trading as J. Cockbill, 407 Post Office-place, Melbourne
Animal Fertilizer	H.C.P. .		5·00	..	5 00	..	4·75	5·25	10·00		11 0 0	H. C. Pannifex, 26 Market-street, Melbourne
,, ,,	Fertbone .		..	4·00	4·00	..	2 00	8·00	10·00		10 12 6	,, ,, ,,
,, ,,	Arc ..		..	6·00	6·00	..	5 00	7·00	12·00		11 15 0	,, ,, ,,
Bone Fertilizer ..	Castle		..	2 00	2 00	..	1·50	14·50	16·00		10 0 0	,, ,, ,,
Animal Fertilizer	Champion		5·25	.	5 25	..	7·25	5·75	13 00		Not retailed	John Cooke and Co. Aust Pty. Ltd., 534 Collins-street, Melbourne
,, ,,	Elsworth's		.	3 00	3 00	1·50	4·00	9 50	15 00		8 0 0	William Roberts Elsworth, cr. York and Joseph streets, Ballarat
Blood and Bone	Valley .	.	7·65	..	7 65	..	4·90	2·85	7·75		12 0 0	Goulburn Valley Industries Coy. Ltd., Shepparton
Bone and Super.	"Federal," B.S. No. 1		.	1 50	1 50	8·50	3·85	4·65	17 00		8 0 0	The Australian Explosives and Chemical Coy. Ltd., 370 Little Collins-street Melbourne
,, ,,	"Sickle," Mixed, A.		..	1·50	1·50	8·50	3·85	4·65	17·00	.	8 0 0	Cuming Smith and Co. Pty. Ltd., 65 William-street, Melbourne

Supplementary List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915 (No. 2652) for the Year 1923—*continued.*

Description of Fertilizer.	Brand.	Nitrogen				Phosphoric Acid.				Potash.	Price asked for the fertilizer per ton.	Where obtainable
		As Blood.	As Blood and Bone.	As Blood and Flesh.	As Total.	As Water Soluble	As Citrate Soluble.	As Citrate In-soluble.	As Total.			
		%	%	%	%	%	%	%	%	%	£ s. d.	
Bone and Super.	M.L. in diamond No. 1	.		1·50	1·50	8·50	3·85	4·65	17·00	.	8 0 0	The Mount Lyell Railway and Mining Co. Ltd., 381 Little Collins-street, Melbourne
..	Wischer and Co. Pty. Ltd., No. 1		..	1·50	1·50	8·50	3·85	4·65	17·00		8 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Bone and Superphosphate	Elsworth's ..		1·50	1·50	9·00	2·50	5·00	.	16·50		7 0 0	William Roberts Elsworth, cr. York and Joseph streets, Ballarat
.. ..	Cockbill's ..			2·75	2·75	8·50	2·25	5·25	16·00		8 10 0	W. and J. Cockbill, trading as J. Cockbill. 407 Post Office-place, Melbourne

Description of Fertilizer.	Brand.	Nitrogen as Bone.	Phosphoric Acid.	Mechanical Condition.		Price asked for the Fertilizer per ton.	Where Obtainable.
				Fine Bone.	Coarse Bone		
		%	%	%	%	£ s d	
Bonedust .. .	Nova .. .	3·00	18·00	30·00	70·00	10 5 0	H. C. Pannifex, 26 Market-street, Melbourne

Melbourne, 14th February, 1923.

P. RANKIN SCOTT,
Chemist for Agriculture

METEOROLOGICAL OBSERVATIONS.

State Research Farm, Werribee.

Summary of observations made during 1922, and comparisons with averages of previous years:—

Rainfall.

Average annual rainfall for forty-two years prior to 1913 .. = 20·19 inches.
Average annual rainfall for period 1913 to 1921 (9 years) .. . 19·66 „
Rainfall during 1922 .. . . 19·14 „

Bright Sunlight.

Average annual total during 8-year period 1914 to 1921 = 1,900·2 hours = Daily Mean, 5·2 hours
Total during 1922 . = 2,256·6 „ = Daily Mean, 6·2 „

Evaporation.

Average annual total from free water surface during 8-year period 1914 to 1921 = 46·411 inches.
Total during 1922 .. .. = 45·032 „

Mean Air Temperatures.

Period	Dry Bulb.	Wet Bulb.	Maximum	Minimum.	Mean of Max. and Min.
Average for 8 years, 1914 to 1921	58·3° F.	51·0° F.	67·3° F.	48·4° F.	57·9° F.
During 1922 ..	58·7° F.	53·6° F.	67·9° F.	47·8° F.	57 9° F

Mean Soil Temperatures.

Period.	At 1 Inch.		At 6 Inches.		At 12 Inches		At 24 Inches.	
	Maximum.	Minimum.	Maximum.	Minimum	Maximum.	Minimum	Maximum.	Minimum
Av'ge for 8 years, 1914 to 1921	68·9° F.	51·8° F.	62·3° F	54·4° F.	60·3° F.	55·8° F.	59·3° F.	57·1° F.
During 1922	71 4° F.	51·2° F.	62·2° F.	55·1° F.	60·3° F.	56·3° F.	59·6° F.	58 0 F

Mean of Maximum and Minimum Soil Temperatures.

Period.	At 1 Inch.	At 6 Inches.	At 12 Inches.	At 24 Inches.
Average for 8 years, 1914 to 1921	60·4° F.	58·3° F.	58·0° F.	58·°2 F.
During 1922	61·3° F.	58·7° F.	58·3° F.	58·8° F.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

As soon as the fruit is off the trees, the land should be well ploughed and left in a rough condition until the spring ploughing. If not already done, and the orchard conditions demand it, there is still time to put in a leguminous crop for green manuring purposes. But this should be done as early as possible, so as to give the crop a chance to make some good early growth. Soils deficient in lime or in organic matter are always benefited by a crop of green manures. Where stable manure is unprocurable, the green manure crop is the only means of adding organic matter to the soil.

Pests and Diseases

All second-hand and old cases should be thoroughly overhauled. It is preferable to do this work now, instead of leaving it till spring, when the rush of other duties will certainly prevent it being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with lime sulphur spray for woolly aphis, peach aphis, and the bryobia mite. And this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

The Flower Garden.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs, as these pests have a very great liking for these succulent growths. A good surface dressing of broken leaf or dust tobacco will effectually deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust forms, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

The Vegetable Garden.

There should now be no untidy or undug beds in the kitchen garden. The vacant beds should all be well dug over and prepared for the planting of vegetables for use in spring. In digging, a top dressing of manure should be given; this may be dug in. All weeds, too, may be forked into the trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year three or four weeks after the manure or weed dressing.

A start should now be made at cleaning out the asparagus beds This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

In establishing a new bed, it is advisable to see that there is a good depth of 2 or 3 feet of rich, well-manured soil. If this is not present, the soil should be dug out to that depth, and thoroughly mixed and enriched with well-rotted manure before being replaced. A bed deeply prepared, and supplied with ample quantities of manure, should last without replanting for very many years The young plants or crowns should then be planted in trenches, keeping the rows 2 or 3 feet apart. An asparagus bed requires ample and direct exposure to the full rays of the sun. The asparagus should not be cut during the first season after planting; in fact, it is better to allow it to go uncut for two seasons. As little foreign weed growth as possible should be allowed in the beds, but, when they are not producing culinary asparagus, rows of lettuce, beans, radish, &c., may be grown between the crowns.

Towards the end of April the tops may be cut down, the beds cleaned and a good top dressing of stable manure given. Chemical fertilizers, such as bonedust, sulphate of ammonia, and sulphate of potash, may be given as a substitute to organic manure. In the past it has been the custom to annually top-dress the beds with salt. It was supposed that, as asparagus in its native habitat was usually found in sandy soils near the sea coast, the plant required salt or a saline soil to produce successful results. It has been found, however, that salt is not at all essential to good growth, and that the plant will readily adapt itself and grow well in soils of not at all a saline character. Where potash has taken the place of salt, quite improved results followed.

Seeds of onion, turnip, cabbage, cauliflower, carrot, and parsnip may now be sown.

REMINDERS FOR MAY.

LIVE STOCK.

Horses.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth Attend to teeth and feet of horses to be turned out for the winter.

Cattle.—Cows, if not housed, should be rugged Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

Pigs.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape barley (especially skinless), oats, &c., may be sown for grazing during winter. Crushed oats will be the most economical feed for pigs at present prices.

Sheep.—Keep in-lamb ewes in strong condition. Best lambing results are obtained when ewes are neither too poor, nor excessively fat. Once the lambs arrive then the most liberal treatment possible is in the main the most profitable. Ill-fed ewes are bad mothers, indifferent to the new-born lamb, and rearing them badly afterwards, particularly very young or very old ewes. Select fine weather for lamb-marking. Yard lambs over night. Never castrate or tail high-conditioned lambs immediately on being run in and overheated. The risk with large lambs will be lessened if they are allowed to stay in the yards an hour or two after castration and the coagulated blood drawn, which in many cases will be found retained in the groin and purse, no matter what method of opening the purse is used. In tailing never draw tails tight. Projecting bone delays healing, especially when cutting off with hot blades. Even with the knife leave enough loose skin to come over and cover the vein and check the usual strong rush of blood from lambs on well-fed mothers.

Poultry.—Feed animal food to forward pullets, about ¼ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily See that fowl houses are free from draughts to avoid colds, also that they are free from red mites. Use Epsom salts freely to avoid Roup and Chicken Pox.

CULTIVATION.

Farm.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

Orchard.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

Flower Garden.—Digging, manuring, and pruning; trench and drain where necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

Vegetable Garden.—Cut down and clean out asparagus beds. Apply manure and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes; sow peas, broad beans, carrots, and parsnips.

Vineyard.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves which continues so long as the leaves remain green. Sheep, or other animals, should not be allowed into the vineyard until the leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., for green manuring, should be sown without delay, in order to take advantage of early rains.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should also be racked and fortified to full strength.

BEE-KEEPING.

May is the last month during which bees may be examined, handled, and, if necessary, fed without risk of endangering the existence of the colonies or seriously interfering with their safe wintering. Supers (upper stories) should be removed and stored indoors in a dry place, care being taken that bee moths cannot get access to the combs. Where suitable storage room is not available indoors, the boxes of spare combs may be left outside, but should be placed underneath the box containing the cluster of bees and the entrance to the hive contracted to one-third or fourth of the summer width.

Small colonies should be reduced to one set of combs in a single story, and any combs not covered by bees are best removed if the amount of stores is insufficient and has to be supplemented by feeding sugar syrup. The amount of honey or sugar syrup necessary to carry bees safely through the winter varies according to the strength of the colony, the locality, and the earlier or later flowering of the spring flora of the district. It is therefore not possible to state what the amount should be; it may, however, be laid down as a general rule that the combs which the bees cover at this time of the year should be at least more than half-full of scaled honey or sugar syrup. When sugar syrup has to be fed to supplement the stores it should be of the density of ripe honey, or approximately two (by weight) to one of water. The simplest way of making syrup is to pour the measured quantity of dry sugar into the correct amount of boiling water, keeping it on the stove and stirrring it till dissolved. The syrup should be given blood warm in a simplicity or frame feeder inside the hive.

The third of the series of articles on the Fruit Industry of Victoria has unavoidably been held over. It is hoped to include it in the Journal for May.

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WATER REQUIREMENTS OF FARM CROPS.

(Continued from page 212.)

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

Experiments in Pot Culture House, Rutherglen.

In the previous article the experiments conducted at Rutherglen and Werribee to determine the water requirements of various crops under field conditions were described.

During 1915 a series of experiments were commenced in a specially constructed pot culture hourse at Rutherglen. This house measured 24 feet by 20 feet, and consisted of a glass roof, gable shaped, 8 feet high at the sides and 13 feet in the centre. The sides were open and protected with blinds, which were only unrolled during showery weather. Along each side of the house a set of rails was laid, on which trolleys large enough to hold six standard pots were run. Two evaporometers were kept inside the pot culture house and two outside. In addition, a thermograph, maximum and minimum thermometers, wet and dry bulb thermometers, were placed within the glass-house, and a similar set of instruments was kept in an observatory screen in the field. Readings were taken daily throughout the year, and comparisons were thus available for crops growing inside the enclosure and in the open field outside.

The tests carried out in 1915-16 season comprised the following:—

A. Water requirements of farm crops.
B. Water requirements of different varieties of the same crop.
C. Effect of varying soil moisture content on the water requirements of wheat and lucerne.
D. Effect of varying fertilizers on the water requirements of wheat.

One hundred and thirty-two pots were used for this series of experiments, and each test was carried out in triplicate.

The pots used were 9 inches in diameter (internal measurement) and 20½ inches deep, and held about 60 lbs. of moist loam. The soil used in all tests except Series D (fertilizer tests) was a mixture of two parts river sand and one part of Rutherglen silt loam.

A frequent source of error in transpiration experiments is the determination of losses by evaporation from the soil. The losses may be greatly reduced by forcing the crops to grow through openings in tight-fitting covers and closing the space between the plant and the opening with wax seals.

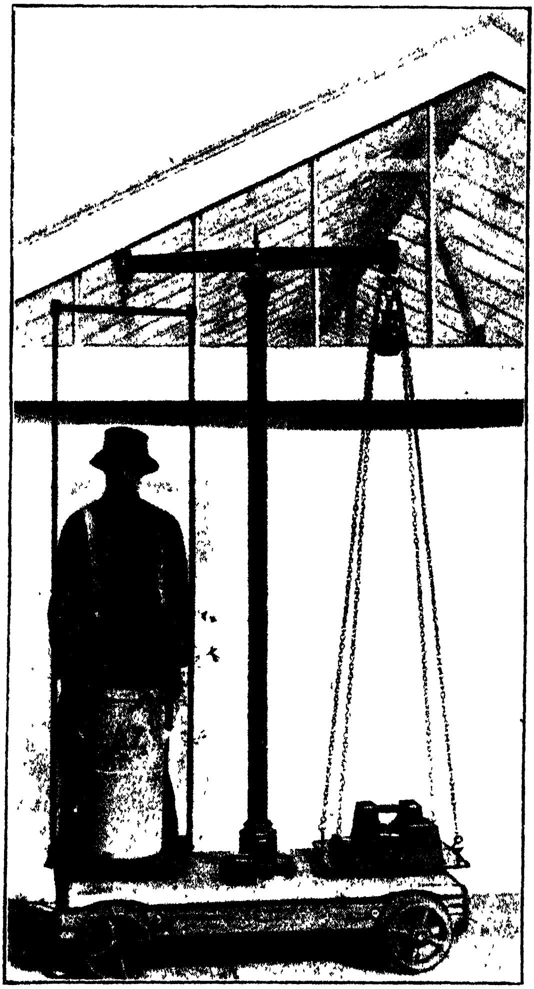


Fig. 9.—Scales used for weighing pots in determination of water requirements of crops.

With the use of gravel mulches and subsoil watering devices, the losses by evaporation may be reduced to very small proportions, and the losses by evaporation from the soil are very small in comparison with losses by transpiration In all the experiments conducted in the pot culture house, water was added through watering tubes of perforated zinc, 16 inches long, tapering from 1 inch in diameter at the top to half an inch at the bottom. The tubes were fitted with linen covers to assist in the uniform and regular distribution of water to the soil. The

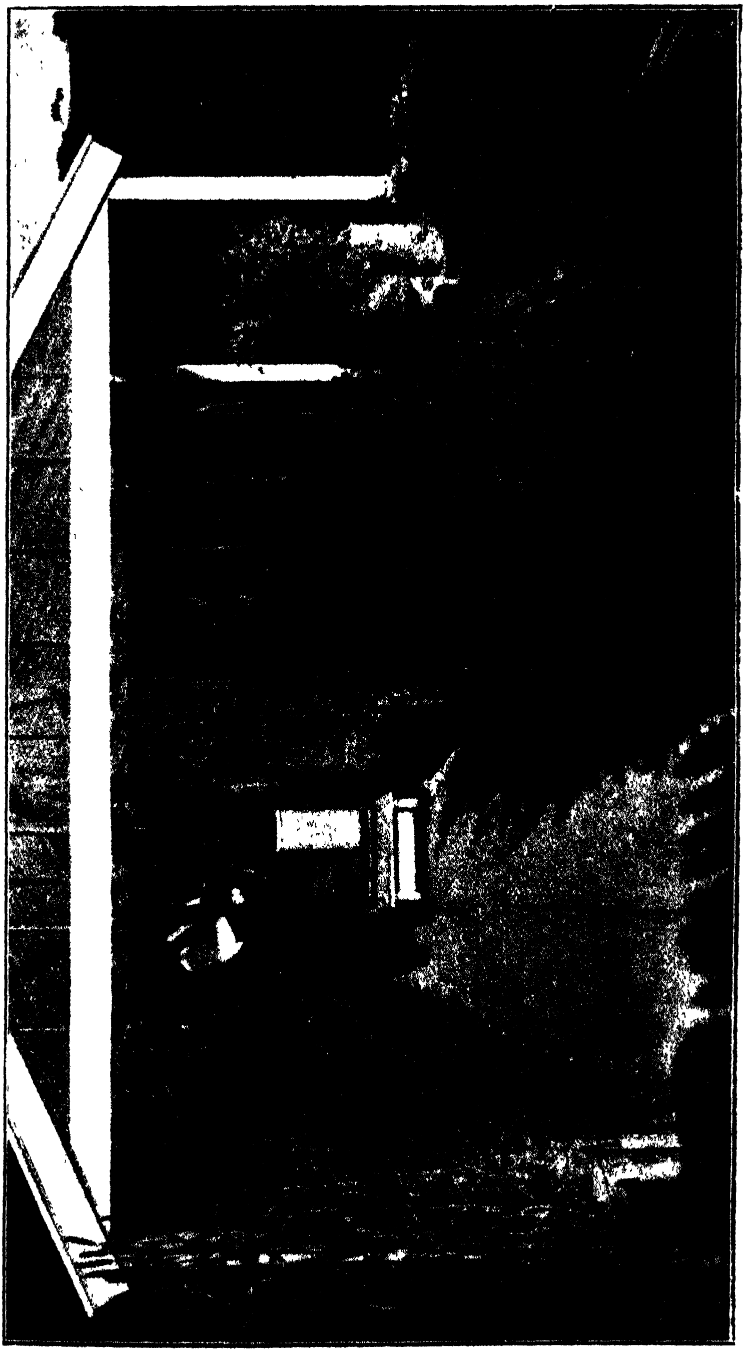


Fig. 10.—Pot Culture House, Rutherglen Experiment Farm.

watering tubes were plugged with corks, and the upper two inches of each tube had a tin band soldered round it.

Gravel mulches 2 inches in depth (gravel three-sixteenths to a quarter of an inch diameter) covered the soil of each pot.

The losses of water from fallow pots were found to be very small in comparison with the losses by transpiration, and were taken to represent the losses by evaporation from the soil surface.

The method of filling the pots was as follows.—40 lbs. of stock soil was added to each pot and the soil tamped down to a uniform volume The watering tubes were placed in position in the centre of the pot, with the top of the tube flush with the top surface of the pot. Twenty pounds of soil was added and uniformly tamped. Five pounds of sifted soil was then mixed with 1 gram $NaNO_3$, ½ gram of superphosphate, and ¼ gram K_2SO_4 and added to each pot. Three seeds were then sown and pressed in ¼-inch deep. Six pounds of washed and sifted gravel was added to each pot to serve as a mulch. Water was then added through the watering tubes to bring the soil moisture content to the desired limit. The crops were sown at the normal seeding time for the district. During the early stages when transpiration losses were small, the pots were weighed weekly. When transpiration was active, the pots were weighed twice a week, except in Series C, where weighings were made each day. The weighing was carried out on a specially-constructed balance (Fig. 9) which turned with a load of 100 lbs. to one-twentieth of a lb.

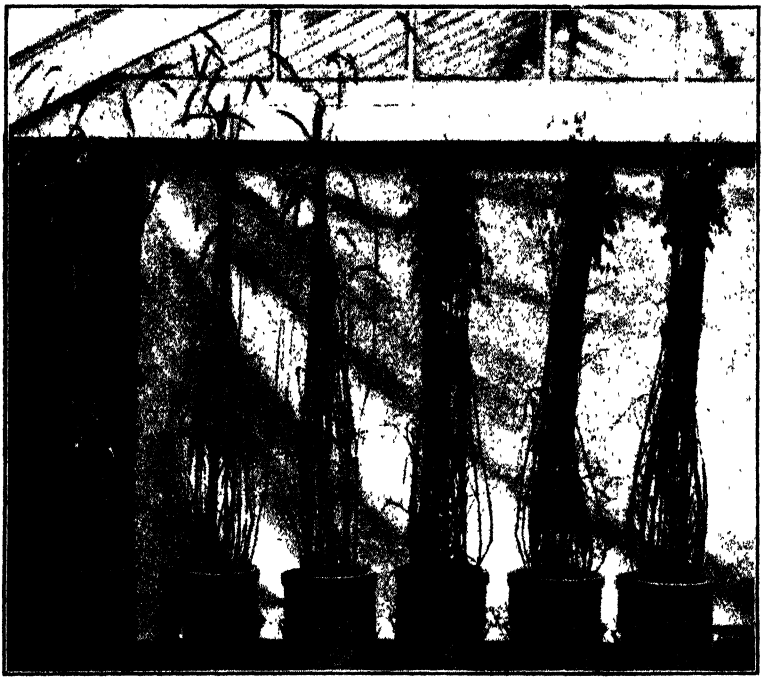


Fig. 11.—A Series—Water Requirements of Crops.
Pots showing growth of Rye ($A4_1$, $A4_2$, $A4_3$) and Oats ($A3_1$, $A3_2$, $A3_3$) at Rutherglen.

A Series—Water Requirements of Various Types of Farm Crops.

Determinations were made of the water requirements of the following crops —wheat, barley, oats, rye, rape, peas, lucerne, beans, mustard. tares, wallaby grass, wild oats.

The following table summarizes the results.—

TABLE VII.

TRANSPIRATION RATIO FOR FARM CROPS GROWN IN POT CULTURE HOUSE, RUTHERGLEN EXPERIMENT FARM, SEASON 1915-16.

Crop	Pot	Water Transpired	Dry Matter Produced.			Transpiration Ratio			
			Straw	Grain	Total	Whole Plant.		Grain.	
		lbs.	grams	grams.	grams				
Wheat (Federation)	$A1_1$	59·33	82·70	36·78	119·48	225	231	748	755
	$A1_2$	65·36	85·69	38·23	123·92	239		779	
	$A1_3$	46·78	63·68	28·61	92·29	230		742	
Barley (Cape)	$A2_1$	72·24	76·50	57·20	133·7	245	237	573	558
	$A2_2$	67·84	78·36	54·50	132·86	232		565	
	$A2_3$	71·70	78·23	60·53	138·76	234		537	
Oats (Algerian)	$A3_1$	90·99	85·19	44·10	129·27	319	332	936	1136
	$A3_2$	88·69	84·96	33·12	118·08	341		1215	
	$A3_3$	93·81	92·70	33·84	126·54	336		1257	
Rye (Giant Winter)	$A4_1$	78·92	83·32	32·40	115·72	309	320	1105	1191
	$A4_2$	81·41	92·18	27·13	119·31	310		1361	
	$A4_3$	81·98	76·79	23·55	109·34	340		1108	
Rape. First Crop (Dwarf Essex)	$A5_1$	63·94			85·89	338	322		
	$A5_2$	65·70			97·77	305			
	$A5_3$	63·55		.	89·23	323			
Rape, Second Crop	$A5_1$	61·28			78·65	353	355		
	$A5_2$	58·77			75·98	351			
	$A5_3$	56·95		.	71·76	360			
Peas (Dun)	$A6_1$	86·05	72·73	72·44	145·17	269	283	539	571
	$A6_2$	83·57	68·77	65·95	134·72	281		575	
	$A6_3$	94·31	71·69	71·69	143·11	299		599	
Lucerne, seven crops (Hunter River)	$A7_1$	140·11			78·30	812	819		
	$A7_2$	181·61	.	.	99·87	826			
Beans (Tick) ..	$A8_1$	63·93	34·22	45·66	79·88	363	380	635	688
	$A8_2$	70·65	37·78	43·22	81·00	396		741	
Mustard (White) .	$A8_3$	87·34	72·92	11·90	84·82	467	464	3329	4037
	$A9_3$	85·13	75·56	8·14	83·70	461		4744	
Tares (Golden) .	$A9_1$	72·66	30·53	13·09	43·62	756	721	2516	2314
	$A9_2$	86·55	38·70	18·60	57·30	685		2511	
Wallaby Grass (*Danthonia*)	$A10_1$	32·03	.		39·71	366	363·5		
	$A10_2$	33·54		.	42·04	361			
Wild Oats (*A. fatua*)	$A11_1$	47·99			92·51	235	237		
	$A11_2$	56·32		..	109·99	232			
	$A11_3$	53·84	.	..	110·62	243			

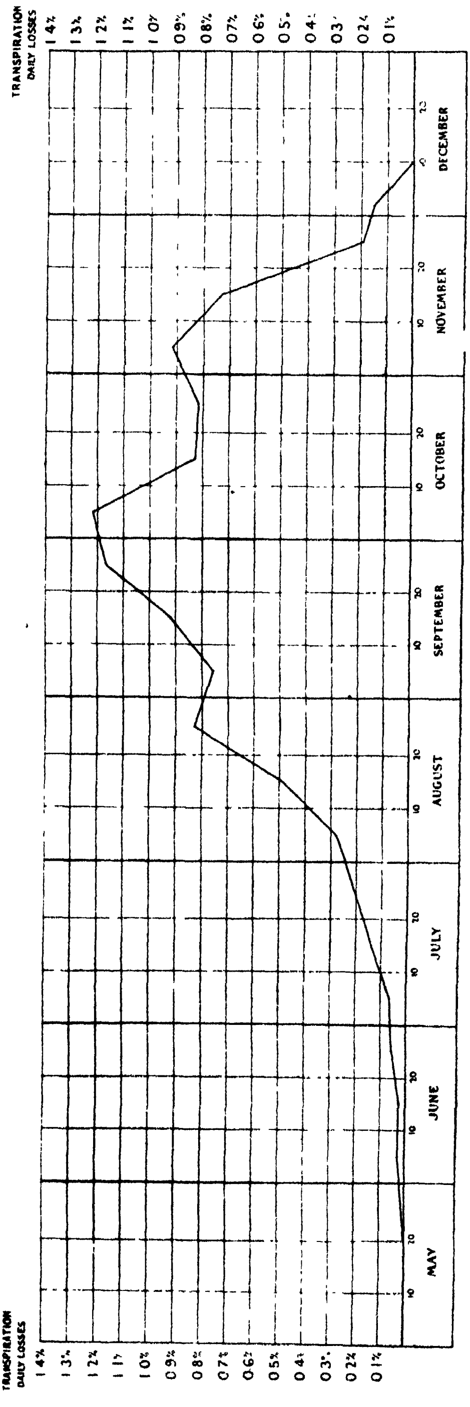


Fig. 12.—March of Transpiration for Wheat Expressed as Percentages of Total Transpiration.

The average Transpiration Ratios for crops grown in the culture house were approximately the same as those recorded under field conditions during the same season. Thus, the average Transpiration Ratio of five crops tested—wheat, barley, oats, rape, peas, grown in the culture house—was 284, whilst the average for the same crops grown under field conditions was 281.

The high roof and open sides of the pot culture house permitted free circulation of air, and, on the whole, gave atmospheric conditions very similar to those obtaining in the field. The protection from rain afforded by the pot culture house not only enabled the evaporation from the soil to be reduced to a minimum, but it also enabled the pots to be maintained throughout the whole of the growing period under more or less constant conditions as regards degree of soil saturation.

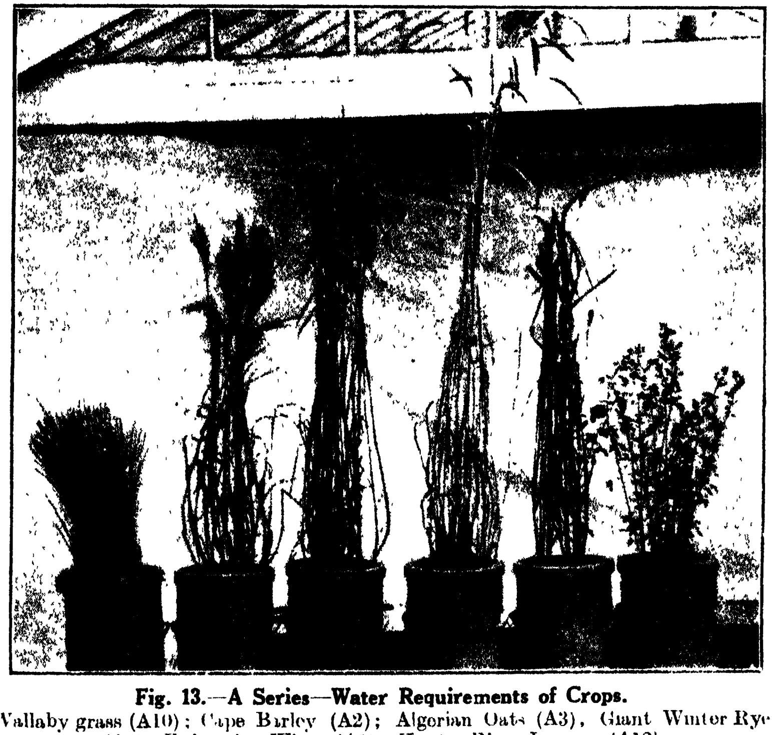


Fig. 13.—A Series—Water Requirements of Crops.
Wallaby grass (A10); Cape Barley (A2); Algerian Oats (A3), Giant Winter Rye (A4); Federation Wheat (A1); Hunter River Lucerne (A12).

For the control of experiments involving the determination of the water requirements of crops under varying degrees of moisture saturation, protection from rain is essential. The average temperatures under the culture house were found to be slightly higher than the temperatures recorded outside, but, on the other hand, the average humidity was greater. The evaporation from a free-water surface was slightly lower inside the house than in the field outside. For October, 1915, the month of maximum transpiration, the evaporation in the culture house was 3.61 inches, as compared with 3.54 inches in the field. The evaporation for the three months, September, October, and November, was 10.95 inches within the house and 12.43 inches outside. We may assume, therefore, that the Transpiration Ratios for crops grown in the culture house will be closely parallel to, although slightly lower than, those for the same crops grown under field conditions.

The results for 1915 show that, in a season favorable for crop production, the Transpiration Ratios for winter-grown crops are relatively low.

Barley and wheat gave much lower Transpiration Ratios for dry matter and grain than either oats or rye, but peas showed the lowest water requirement of all crops tested.

The native Wallaby Grass (*Danthonia*) has a higher water requirement for dry matter than any of the cereals. Compared with all other crops tested, lucerne has a high Transpiration Ratio, the average for the season (seven cuts) being 819.

The water requirement of lucerne varied with the season of the year at which it was cut. The crops harvested during spring gave a lower water requirement as compared with crops harvested in summer or early autumn.

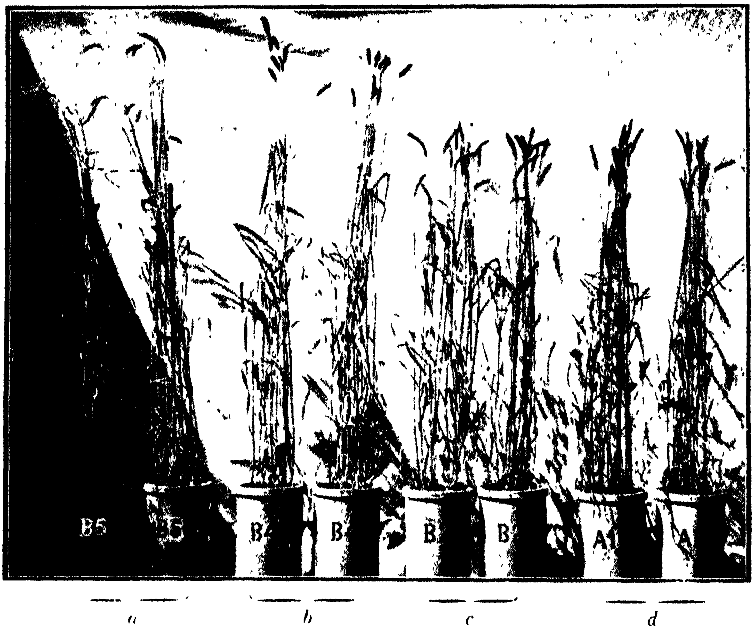


Fig. 14.—Water Requirements of Different Varieties of Wheat.
(*a*) Kubanka. (*b*) Huguenot. (*c*) Yandilla King. (*d*) Federation.

The duplicate pots show a fairly close agreement for the Transpiration Ratios for dry matter, but exhibit considerable fluctuations in the percentage of grain to total dry matter. Hence the Transpiration Ratios for grain show a wider range of variation than the Transpiration Ratios for dry matter. With any given crop the Transpiration Ratio for dry matter is much more constant than the Transpiration Ratio for grain.

The march of transpiration for wheat grown in the pot culture house during 1915 is shown graphically in Figure 12. In this graph the losses by transpiration are shown in 10-day periods throughout the growing period of the crop. The daily losses by transpiration increased rapidly from the middle of August to the first ten days in October, when the daily losses were at a maximum. Transpiration was very active in October, but fell rapidly during November with the translocation of the elaborated materials from the straw and the ripening off of the crops.

The transpiration graph for wheat was plotted from the average daily losses by transpiration of the wheats grown in the C2 Series (described later), in which the pots were weighed daily and maintained throughout growth at a uniform moisture content equal to 45 per cent. of saturation.

These losses throughout the period of growth are summarized in the table hereunder

TABLE VIII.

DAILY TRANSPIRATION AND TRANSPIRATION LOSSES FOR TEN-DAY PERIODS WITH WHEAT UNDER POT CULTURE CONDITIONS FROM SEEDING TO HARVEST EXPRESSED AS PERCENTAGES OF THE TOTAL WATER TRANSPIRED.—SEASON 1915-16.

Period		Days	Water Transpired.	Average Daily Losses	Percentage Transpired during Period	Loss per Calendar Month
			lbs.	per cent.	per cent.	per cent.
May	5-25	20	·36	018	·370	..
	25-31	5	18	·036	18	55
June	1-10	10	30	·03	30	
	10-20	10	30	·03	·30	..
	20-30	10	58	·06	59	1·19
July	1-10	10	·70	·07	71	..
	10-20	10	1·40	14	1·42	..
	20-31	11	2 31	21	2 33	4·46
August	1-10	10	2·80	·28	2·83	..
	10-20	10	4·74	·49	4·88	..
	20-31	11	8·97	·83	9 08	16 79
September	1-10	10	7·75	76	7·64	..
	10 20	10	9·04	·92	9·15	.
	20 30	10	11·60	1·17	11 72	28 51
October	1-10	10	12 04	1·22	12 20	.
	10-20	10	8·24	·83	8·33	..
	20-31	11	8·87	·82	8 98	29·51
November	1-10	10	9·09	·92	9·19	..
	10-20	10	7·23	·73	7·31	..
	20-30	10	1·90	19	1·92	18·42
December	1-4	4	·58	·15	·59	·59
			98·82	.	100·02	99·65

The march of transpiration for barley and oats was similar to that of wheat, except that the period of maximum transpiration for oats occurred during November.

In the A series of tests, in which barley, wheat, and oats were grown under similar conditions, the time of maximum transpiration was found to be October 10-20 for wheat and barley, and November 1 to 10 for oats. The amount of water transpired during ten days of maximum activity and during the month of maximum transpiration in 1915 was as follows:—

Crop	Percentage of Total Water Transpired	
	During 10 days of Maximum Transpiration (October 10–20).	During Calender Month of Maximum Transpiration
	%	%
Wheat	12·5	33·4 (October)
Barley	14·3	38·5 (October)
Oats	12·0	33·6 (November)

The three cereals showed close agreement as to relative amount of water transpired during ten days and during a calendar month of maximum activity during 1915. Transpiration at this period, however, was slightly greater with barley than with wheat and oats. The transpiration graph for cereals grown in the pot culture house during 1915 was somewhat similar to the graphs shown, for crops grown under field conditions in the drought year, except that the growing season was more prolonged and transpiration was less intense during October, 1915, than in October, 1914.

Though in a normal year the growing period of these crops is about seven months, approximately one-third of the total water transpired was used during one month, in season 1915, by oats and wheat, and nearly 40 per cent. by barley. With wheat, 76 per cent. of the total water required is used during the three months, September, October, and November. The march of transpiration for a perennial forage crop such as lucerne differs materially from that of annual grain crops Transpiration increases steadily to a maximum at the time of cutting This is brought out very clearly in the table showing the losses from the second, third, and fourth cuttings of a lucerne crop, in three-day periods, expressed as percentages of the total water used.

TABLE IX.

SHOWING MARCH OF TRANSPIRATION FOR LUCERNE IN THREE-DAY PERIODS EXPRESSED AS PERCENTAGES OF TOTAL WATER USED.

Successive three-day period	Water transpired in successive three-day periods.			Percentage of water transpired in three-day periods		
	2nd cut	3rd cut	4th cut	2nd cut Oct. 14th–Nov. 22nd	3rd cut. Nov. 22nd. Dec 13th	4th cut. Dec. 13th Jan. 3rd.
	lbs.	lbs.	lbs.			
1	·52	·34	·86	1·1	1·1	2·6
2	1·2	1·34	1·86	2·5	4·2	5·5
3	1·33	2·03	2·90	2·8	6·3	8·6
4	1·22	5·54	4·10	2·5	17·3	12·2
5	1·82	4·89	8·85	3·8	15·3	26·4
6	3·40	8·46	7·49	7·1	26·5	22·3
7	3·77	9·37	7·50	7·9	29·3	22·3
8	4·55		..	9·5		..
9	4·79	..	..	10·0		
10	6·22	..	..	13·0	..	..
11	5·18	..	..	10·8		..
12	6·91		..	14·4	..	..
13	6·97	..		14·6	..	..
	47·88	31·97	33·56	100·0	100·0	99·9

The time taken to bring a crop of lucerne to the stage at which it is harvested for hay (beginning of flowering) varied with the time of the year. During December and January, growth was rapid and the crop ready for cutting in 21 days. During October and November the lucerne required 39 days to reach the same stage of maturity. During the summer a lucerne crop at the maximum activity will transpire nearly 30 per cent. of the total water required to mature a hay crop in a three-day period.

Lucerne uses relatively large quantities of water compared with other farm crops. During winter and early spring it uses this water economically in the production of dry matter, but in midsummer the Transportation Ratio is often double or treble that of winter-grown lucerne This point will be brought out more fully later

Series B.—Water requirements of Different Varieties of Wheat.

A series of eighteen pots was sown with different varieties of wheat (in triplicate) to determine whether wheat varieties showed much variation in their ability to use soil moisture economically.

For this purpose three locally-bred wheats, Yandilla King, Federation, and Dart's Imperial, each of which has been widely grown in the Australian wheat belt, were selected, together with Indian 5, a variety with extremely short straw and considerable drought-resisting powers; Huguenot, and Kubanka, two typical Durum wheats Three pots were kept under fallow as controls.

The results are summarized in the following table —

TABLE X.

WATER TRANSPIRED, DRY MATTER PRODUCED, AND TRANSPIRATION RATIO FOR DRY MATTER AND GRAIN FOR SIX VARIETIES OF WHEAT

Variety.	Species	Water transpired and evaporated	Water evaporated	Water transpired	Total dry matter, grain and straw	Dry matter in grain	Percentage of grain to dry matter	Transpiration ratio for dry matter.	Transpiration ratio for grain
		1 lb.	1 lb.		grams	grams.	%		
Yandilla King	T. Sativum	55·06	5·24	49·82	108·03	34·21	31·7	209	660
Federation	,,	64·29	,,	57·39	111·90	34·54	30·9	231	752
Dart's Imp	,,	67·53	,,	62·29	123·96	28·81	23·2	227	976
Indian 5	T. compactum	59·47		54·23	106·97	33·31	31·1	230	740
Huguenot	T. durum	63·29	,,	58·05	107·08	25·61	23·9	243	1,081
Kubanka	,,	61·33	,,	56·09	106·52	21·52	20·2	238	1,188

The whole of the pots was maintained throughout the period of growth at a moisture content varying from 50 per cent. to 60 per cent. of saturation.

The results of the tests show that the varieties of wheat did not vary widely in regard to the quantity of water required to elaborate a unit of dry matter. The most efficient producer of dry matter was Yandilla King, with a Transpiration Ratio of 209, whilst the Transpiration Ratio for Huguenot was 243.

Whilst the Transpiration Ratio for dry matter was fairly constant with these varieties, the Ratio for grain produced showed wide differences, Yandilla King requiring 660 units of water to elaborate a unit of grain, as compared with 1,188 in the case of Kubanka.

The results of the tests are of importance in the breeding of wheat varieties for arid localities For these dry areas it is very necessary that the types chosen should produce a maximum yield of grain from a unit quantity of soil moisture. Yandilla King, Federation, and Indian 5 showed marked superiority in this respect over Huguenot and Kubanka. These three varieties gave an average percentage of grain to straw of 45.3, as compared with 28.3 per cent. in the case of Huguenot; or, expressing the grain in terms of dry matter, a percentage of grain to total dry matter of 31 7 per cent., as against 20.2 per cent.

Since the amount of water required to produce a unit of dry matter in any given season is fairly constant for most wheat varieties, it follows that the determination of the Transpiration Ratio is not essential for the selection of varieties suited for arid conditions.

A most useful criterion is the relative proportion of grain to straw—the migration ratio—for this is a measure of the efficiency of the plant for utilizing the limited supplies of soil moisture for grain production Indeed, we find that when crops of the same variety are grown on soils of varying moisture content, the plants growing on the low-moisture content adjust their mode of growth to their environment and produce spare-stooling, short-strawed, narrow-leaved plants, bearing a relatively high proportion of grain and a relatively extensive root system. The same crop grown on a soil maintained at a high moisture content will be tall, leafy, and bear a lower percentage of grain to straw, and a relatively poor root system. Hence we may say that a high migration ratio is a factor of importance in the search for new varieties for arid districts, for this determines whether the Transpiration Ratio for grain will be low or high, or whether the variety will utilize the scanty water supplies economically or wastefully in the production of grain

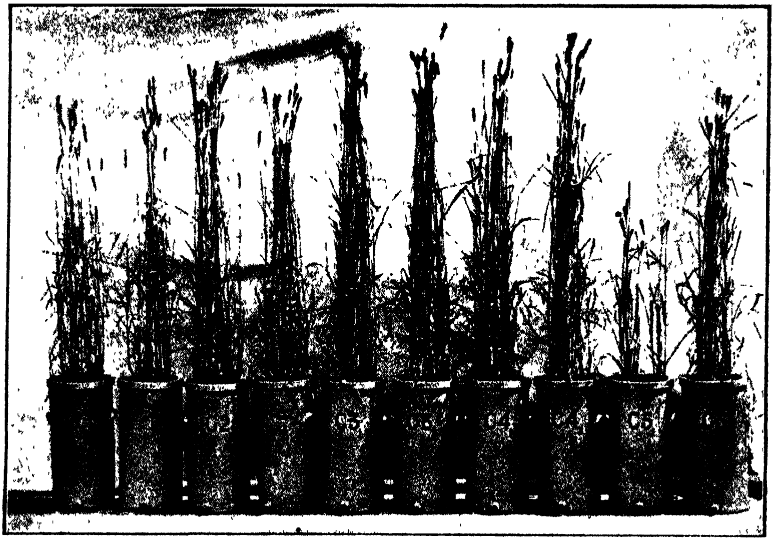


Fig. 15.—C Series—Influence of Degree of Saturation on Water Requirements of Wheat.

C1, 37 %; C2, 45 %; C3, 60 %, C4, 75 %; C5, 90 % of Saturation.

Series C.—Effect of Varying Moisture Content on the Water Requirements of Crops.

The effect of varying moisture content on the water requirements of both wheat and lucerne was determined by maintaining a series of pots growing wheat and lucerne at fixed degrees of soil saturation throughout the year. The degrees of saturation chosen were 30 per cent., 45 per cent., 60 per cent., 75 per cent., and 90 per cent. of the estimated water-holding capacity of the soil.

The pots were weighed weekly during June and July, when transpiration losses were very small, twice weekly during August, and daily from September till harvest. At harvest time the total crop from each pot was cut level with the surface of the ground. The soil from each pot was placed on a fine sieve, and the roots from each crop carefully separated by washing the soil away from the roots with a fine spray.

The roots were cut away from the small portions of straw left as stubble, and the "butts" of stubble were regarded as "overhead portion" of the crop. The following table summarizes the results:—

TABLE XI.

EFFECT OF VARYING DEGREES OF SOIL SATURATION ON PRODUCTION OF DRY MATTER, PERCENTAGE OF GRAIN TO STRAW, RATIO OF ROOTS TO OVERHEAD PORTION, AND TRANSPIRATION RATIO FOR DRY MATTER AND A GRAIN OF DART'S IMPERIAL WHEAT.—SEASON 1915-16.

Sown 1st May, 1915; Harvested 7th December, 1915.

Pot	Saturation	Total water lost.	Losses from check Fallow pots.	Water transpired.	Dry Matter in—			Percentage of Grain to Straw	Ratio Roots to overhead portion.	Transpiration Ratio for			
					Grain	Straw.	Total.			Dry Matter		Grain	
		lbs.	lbs.	lbs	grams.	grams.	grams.						
$C1_1$	30%	61·59	1·71	59·88	32·47	81·28	113·75	39·9	1 · 9·0	230	235	837	823
$C1_2$	30%	59·53	1·71	57·82	32·42	81·22	113·64	39·9		231		809	
$C2_1$	45%	82·83	3·98	78·85	35·61	109·21	144·82	32·6	1 · 11·1	247	226	1004	921
$C2_2$	45%	60·93	3·98	56·95	30·69	89·00	119·09	34·4		217		858	
$C2_7$	45%	73·18	3·98	69·20	35·51	112·33	147·84	31·6		212		884	
$C2_8$	45%	77·93	3·98	73·95	35·77	111·11	146·88	32·2		228		938	
$C3_1$	60%	93·94	4·40	89·54	33·32	126·63	159·95	26·3	1 · 12·7	254	256	1220	1145
$C3_2$	60%	103·32	4·40	98·92	42·01	132·84	174·85	31·6		257		1069	
$C4_1$	75%	75·60	4·70	70·90	25·63	117·15	142·78	21·9	1 : 15·9	225	259	1255	1395
$C4_2$	75%	101·80	4·70	97·18	36·63	135·21	171·84	27·1		257		1203	
$C4_7$	75%	31·77	4·70	27·07	7·72	41·32	49·04	18·8		250		1591	
$C4_8$	75%	60·47	4·70	55·77	16·50	67·20	83·70	24·5		302		1533	
$C5_1$	90%	31·77	6·35	25·42	5·14	24·65	29·78	20·8	1 · 18·8	380	307	2253	1924
$C5_2$	90%	60·47	6·35	54·12	15·61	89·28	104·89	17·5		234		1594	

The table brings out very clearly the following points:—

(1) The maximum yield of both straw and grain for wheat was obtained when the moisture content of the soil was maintained at 60 per cent. of the water-holding capacity.

The yield both of grain and straw declined as the degree of saturation was increased or diminished, but the decline in yield, particularly of grain, was more marked with high than with low degrees of saturation.

(2) The Transpiration Ratio for dry matter for wheat does not vary greatly with the degree of saturation, but, on the whole, the water requirement for dry matter is greater in a moist than in a dry soil,

and is lowest for a soil maintained at a moderate degree of soil humidity (45 per cent.)

(3) The water requirement for grain consistently and markedly increases as the degree of soil saturation increases, and with soil maintained at highest degrees of saturation the water cost for grain produced is more than double that associated with low saturation.

(4) The percentage of grain to straw was highest in the soil of low saturation, and the proportion of grain to straw consistently decreases with increasing soil saturation.

(5) The proportion of root to overhead development consistently diminishes with increasing soil saturation. The percentage of root to grain and straw is 11.1 per cent. in soil maintained at 30 per cent. of its water-holding capacity and only 5 per cent. in soil maintained at 90 per cent. of its water-holding capacity.

With the soil maintained throughout the period of growth at 30 per cent. of saturation, the percentage of grain to straw averaged 39.9 per cent. With a soil maintained at 90 per cent. of saturation, the proportion of grain to straw fell to 19.2 per cent.

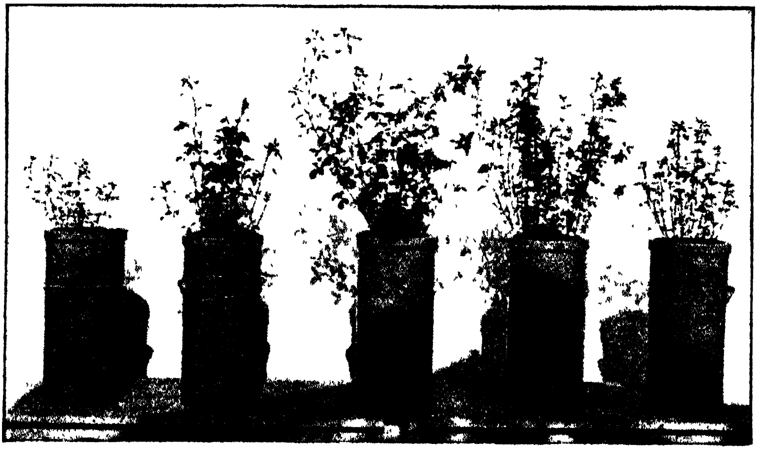


Fig. 16.—Effect of Varying Moisture Content on Water Requirements of Lucerne.
Pots maintained at, C1, 30%; C2, 45%; C3, 60%; C4, 75%; C5, 90% Saturation.

Not only is the water requirement for dry matter greater with high than with low soil humidity, but the proportion of grain to straw and total dry matter rapidly diminishes with increasing soil humidity, so that the Transpiration Ratio for grain rapidly increases with increasing soil saturation.

The wheat grown in these pots was of one variety—Dart's Imperial—and a pure line.

Obviously the character of the wheat, and particularly the proportion of grain to straw, varies considerably with the nature of the medium in which it is grown. The conditions obtaining in the pots kept at 30 per cent. of saturation are really comparable with those actually existing in arid regions, whilst the conditions in the pots maintained throughout the growing period at high saturation are really comparable with soils enjoying a high rainfall.

It will be observed that arid conditions, *i.e.*, the pots of low saturation (30 per cent.), produce plants with a high proportion (40 per cent.) of grain to straw. They also produce an extensive root system, the dry weight of which was 11.1 per cent. of the grain and straw produced. On the other hand, the humid soils, *i.e.*, pots maintained at 90 per cent. of saturation, produced plants with the lowest percentage of grain to straw (19.1 per cent.) and a comparatively meagre root system, the latter weighing only 5.3 per cent. of the grain and straw produced.

In the arid soil, Dart's Imperial wheat produces plants characterized by a high percentage of grain to straw, and a relatively extensive root system. In humid soil the plants are characterized by a very low percentage of grain to straw and a poorly-developed root system.

TABLE XII

EFFECT OF VARYING SOIL SATURATION ON THE TRANSPIRATION RATIO OF LUCERNE

Degree of Soil Saturation.	First Cut (111 days)	Second Cut (39 days)	Third Cut (21 days)	Fourth Cut (22 days)	Fifth Cut (21 days)	Sixth Cut (25 days)	Seventh Cut (30 days)	Eighth Cut (50 days)	Transpiration Ratio for Season
30 per cent. (C1)	612	644	605	1252	1143	1161	1046	1087	885
45 per cent. (C2)	565	626	596	1190	1126	1163	1055	1000	808
60 per cent. (C3)	540	550	566	1142	1065	1191	973	860	753
75 per cent. (C4)	534	592	624	1315	1172	1293	1109	928	801
90 per cent. (C5)	512	593	919	1921	1294	905	1137	*	†756
Average for each cut	552	601	661	1364	1160	1143	1064	969	801
Evaporation from free water surface during each period of growth (inches)	4·01"	5·97"	5·50"	6·90"	6·94"	7·89"	7·65"	7·27"	52·13

* Plants died † Average for seven cuts only

Varying degrees of soil saturation do not appear to have any marked effect on the Transpiration Ratio for lucerne. On the whole, lucerne grown on soils maintained at a moderate degree of soil saturation (60 per cent. of the maximum water-holding capacity) gave the lowest water requirement. The Transpiration Ratio increased as the soil saturation increased or diminished from 60 per cent. of saturation. With the highest degree of soil saturation (90 per cent.) the lucerne grew well and used water efficiently only when the plants were young and the root system was developing. The plants gradually weakened, and showed abnormally high Transpiration Ratios for the third and fourth cuts. During January the plants in one pot died, and those in the other pots became so stunted that water was withheld until they recovered.

The plants in C5, apparently had a low water requirement, but this was due to the fact that the bulk of the dry matter was produced early in the year when the Transpiration Ratios were low. The average Transpiration Ratio for the season, based on total water used to dry matter produced, was only 801, whilst the arithmetical mean of the separate Transpiration Ratios for each cut was 910

It appears that lucerne gives the lowest water requirement with moderate degrees of saturation. When it is grown on soil maintained at either low or high degrees of saturation, the water requirement is increased and the yield of lucerne materially reduced. On May 8, after the final harvest was gathered, two pots from each series were used to determine the root development in each group of pots. The soil contained in the pots was emptied into a fine sieve and the roots separated by washing away the soil in a gentle stream of water.

The following table summarizes the results:—

TABLE XIII.

WEIGHT OF DRY MATTER IN ROOTS AND OVERHEAD PORTION OF LUCERNE GROWN IN SOILS MAINTAINED AT VARYING DEGREES OF SATURATION.

Degrees of Soil Saturation.	Weight of Dry Matter in Overhead Portion.	Weight of Roots.	Total Weight of Plant.	Ratio.	
				Roots.	Overhead Portion.
	grams.	grams.	grams.		
30%	102·38	30·87	143·25	1	3·3
45%	132·07	37·96	170·03	1	3·5
60%	139·17	23·50	162·77	1	5·9
75%	145·97	28·48	174·40	1	5·1
90%	49·48	6·16	55·64	1	8·0

With lucerne, as in the case of wheat, the proportion of roots to overhead matter diminishes with increasing soil saturation.

With the lower limits of saturation, *i.e.*, 30 per cent. of the water holding capacity, 1 lb. of dry root is produced to every 3.3 lbs. of dry matter produced overhead. With a soil verging on saturation, *i.e.*, 90 per cent. of water-holding capacity, 1 lb. of dry roots is produced for each 8 lbs. of dry matter in the overhead crop.

There was a very marked development of fine roots of both lucerne and wheat in the pots maintained at 30 per cent. and 45 per cent. of saturation, as compared with the roots systems of these plants in the pots maintained at 75 per cent. and 90 per cent. of saturation. A photograph of the roots of wheat extracted from one pot maintained at 30 per cent. saturation is shown in Fig. 20, page 283

The effect of varying degrees of soil saturation on water requirements of wheat and lucerne may be summed up as follows:—

(*a*) The Transpiration Ratio for dry matter is not materially affected by a variation in the degree of saturation except in the case of extreme conditions of saturation or dryness, in which case high Transpiration Ratios result.

(*b*) Both in the case of wheat and lucerne moderate degrees of soil saturation produce a lower Transpiration Ratio than high or low degrees of saturation.

(*c*) The water requirement for grain consistently increases as the degree of soil saturation increases.

(*d*) The percentage of grain to straw in wheat consistently decreases with the increasing soil saturation.

(*e*) Both with wheat and lucerne there is a marked and consistent increase in root development with decreasing soil saturation.

Series D.—Effect of Fertilizers on the Transpiration Ratio.

A series of tests was carried out to determine whether the addition of fertilizers influenced the Transpiration Ratio of wheat. The method adopted was to secure a naturally poor soil—a mixture of equal parts of beach sand and river sand—and to add various combinations of fertilizers—phosphoric acid, nitrogen, potash, lime—and to measure the effect of light and heavy dressings of each on the Transpiration Ratio. Beach sand from Carrum and river sand from Black Dog Creek, Rutherglen, were mixed in equal proportions The air-dry mixed sample gave the following analysis:—

	Percentage
Moisture	.208
Nitrogen	Trace
Phosphoric acid	016
Potash	020
Lime	042
Magnesia	023
Oxide of iron and alumina	135
Chlorine	.004
Loss on ignition	.227

The actual water-holding capacity of the soil was determined to be 19.4 per cent. The real specific gravity was 2.64, the apparent specific gravity 1.667.

Fourteen series of pots, each series in triplicate, *i.e.*, 42 pots in all, were treated as follows:—

1. Control (no fertilizer).
2. Normal dressing of complete fertilizer (N, P, K, Ca)
3. No nitrogen, but normal dressing of P, K, Ca.
4. Excess of nitrogen and normal dressing of P, K, Ca
5. No phosphoric acid but normal dressing of N, K, Ca.
6. Excess of phosphoric acid and normal dressing of N, K, Ca
7. No potash, normal dressing of N, P, Ca.
8. Excess potash, normal dressing of N, P, Ca.
9. No lime, normal dressing of N, P, K.
10. Excess lime, normal dressing of N, P, K
11. Excess of nitrogen and phosphoric acid, normal dressing of K and Ca.
12. Excess of nitrogen, phosphoric acid, and potash, normal dressing of lime.
13. Excess of nitrogen, phosphoric acid, and potash and lime.
14. Fallow—Control for determination of evaporation from the soil.

The dressings were arranged so that with each fertilizer there would be an excess of one fertilizer in one series of pots and a deficiency of that fertilizer in another.

The normal dressings for each fertilizer were as follows:—Nitrogen was applied as nitrate of soda at the rate of ½ gram per pot, approximately 100 lbs. per acre. Phosphoric acid was applied at the rate of 1 gram of superphosphate (20 per cent. P_2O_5) per pot, *i.e.*, 200 lbs. superphosphate per acre. Potash, ½ gram per pot, 100 lbs. per acre, and lime as calcium carbonate, 5 grams per pot, 1000 lbs. per acre.

The excess dressings were applied at the rate of ten times the normal dressings for each ingredient. Throughout the period of growth the pots were weighed weekly and brought to a constant weight of 108 lbs., which approximated 60 per cent. of water-holding capacity of the soil.

In spite of the poverty of the soil, the crop grown on some of the manured pots was exceptionally heavy and well developed. Even in the no-manure pot, the crop grew to maturity and formed some grain. At maturity the grain, straw, and roots from each pot were harvested. The roots were separated by emptying the soil from the pots on to a box-sieve of one-tenth-inch mesh and the sand washed through the sieve by means of a gentle stream of water.

The results are summarized in table on this page.

Effect of Fertilizers on the Yield.

The results show a remarkable variation in the yield of grain and straw with the various applications. The D_1 series of pots, though receiving no fertilizer, matured a crop of grain which calculated on the area of the pot, was equivalent to 12.2 bushels per acre. The D_{13} series, fertilized with an excess of nitrogen, phosphoric acid, potash, and lime, gave a yield of 42.84 grams of grain per pot, equivalent to a yield of 122 bushels per acre. This result is explained by the fact that throughout the period of growth the soil in the pots was kept under optimum conditions of moisture saturation, *i.e.*, maintained at between 50 and 60 per cent. of water-holding capacity, which would be almost impossible of accomplishment under ordinary field conditions

TABLE XIV

EFFECT OF VARIOUS FERTILIZERS ON THE PRODUCTION OF DRY MATTER, TRANSPIRATION RATIO FOR DRY MATTER AND GRAIN, AND ON THE RELATIVE DEVELOPMENT OF ROOTS, STRAW, AND GRAIN OF WHEAT GROWN ON SAND.

Plots	Treatment	Water Transpired.	Dry Matter Produced				Ratio			Per cent. of roots to total weight of plant.	Transpiration Ratio	
			Roots	Grain	Straw	Total	Roots	Grain	Straw		Grain and Straw	Grain only
		lbs.	grms	grms.	grms	grms.						
D 1	No manure	12·77	2·09	4·28	11·12	17·49	1	1·12	6·0	11·2	377	1355
D 2	N, P, K, Ca (normal dressing)	25·58	4·25	9·54	32·59	46·39	1	2·24	7·6	9·2	292	1216
D 3	P, K, Ca—No Nitrogen	15·78	1·67	6·14	15·49	23·30	1	3·7	9·3	7·2	348	1178
D 4	P, K, Ca—Excess Nitrogen	51·43	3·99	21·88	57·80	83·67	1	5·4	14·4	4·8	302	1070
D 5	N, K, Ca—No Phosphoric Acid	25·42	3·25	9·39	30·16	42·70	1	2·9	9·3	7·6	306	1259
D 6	N, K, Ca—Excess Phosphoric Acid	28·07	3·95	10·13	37·12	51·20	1	2·6	9·4	7·7	278	1298
D 7	N, P, Ca—No Potash	28·02	3·01	10·08	35·14	48·23	1	3·3	11·6	6·2	292	1246
D 8	N, P, Ca—Excess Potash	27·96	3·15	11·56	35·26	49·97	1	3·7	11·2	6·3	283	1092
D 9	N, P, K—No Lime	26·04	3·29	9·01	31·18	43·48	1	2·8	9·4	7·6	311	1314
D 10	N, P, K—Excess Lime	27·86	3·69	10·62	33·92	48·23	1	2·9	9·4	7·7	296	1184
D 11	K, Ca—Excess Nitrogen and Phosphoric Acid	106·95	5·30	41·86	120·10	166·96	1	7·9	22·6	3·2	304	1160
D 12	Ca—Excess of Nitrogen, Phosphoric Acid and Potash	88·89	5·39	39·89	90·41	135·69	1	7·4	17·1	4·0	309	1012
D 13	Excess of Nitrogen, Phosphoric Acid, Potash and Lime	82·20	5·82	42·84	99·42	148·08	1	7·3	17·1	3·9	270	871

Let us examine the effects of the fertilizers on the yield of produce, the relative root development, the Transpiration Ratio, the composition of the plant, and the relative absorption of soil solutes.

1 EFFECT ON YIELD.

The influence of the various fertilizers on the relative yield of grain straw and total dry produce is illustrated in Fig. 17.

The application of a normal dressing of nitrogen, phosphoric acid, potash, and lime nearly trebled the yield of total dry matter. Nitrogen produced a greater effect on crop yields than any other treatment.

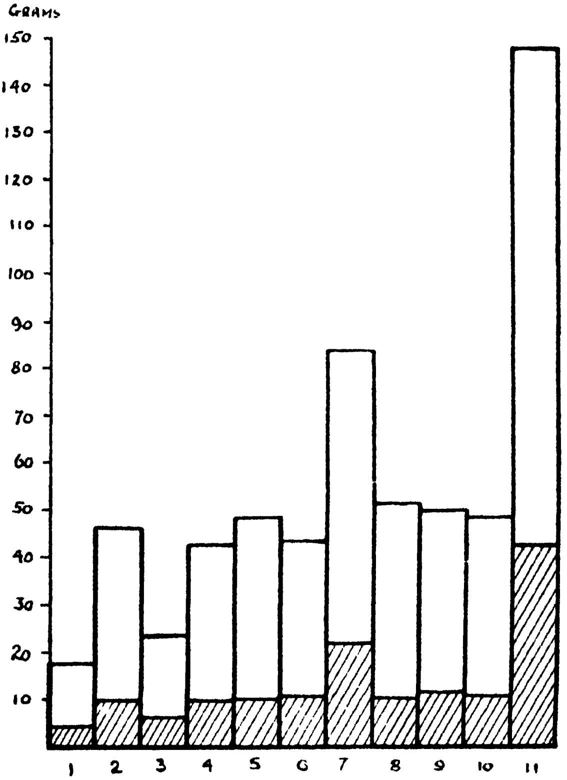


Fig. 17. Effect of Deficiency and Excess of Various Fertilizers on Wheat Grown in Sand but Maintained at 50 - 60% Saturation.

1. No manure
2. Normal—N, P, K, Ca
3. P, K, Ca—No N.
4. N, K, Ca—No P.
5. N, P, Ca—No K
6. N, P, K—No Ca
7. P, K, Ca Excess N
8. N, K, Ca - Excess P
9. N, P, Ca Excess K.
10. N, P, K—Excess Ca O
11. Excess of N, P, K, Ca O

Grain thus ▨

When phosphoric acid, potash, and lime were added without nitrogen, the yield was only slightly greater than that of the manured plot. When nitrogen was applied in excess, the other nutrients being present as before, the crop yield (compared with the control) was more than quadrupled. In contrast with the effects of nitrogen, the application of excess quantities either of phosphoric acid, potash, or lime produced no material increase in yield as compared with the plots receiving a normal dressing of these nutrients.

When excess of nitrogen and phosphoric acid were added the greatest total yield was obtained; but the highest actual yield of grain was obtained where an excess of all nutrients was used.

2. Effect on Root Development.

The effect of the fertilizers on the root system of wheat is marked Where no manure was used no less than 11.2 per cent. of the total weight of the crop consisted of roots. Where all nutrients were applied in normal dressings 7.1 per cent. of the total weight of the crop consisted of roots. Finally, where excess dressings of all nutrients were applied the percentage of roots to total dry matter in the plant was only 3.9 per cent.

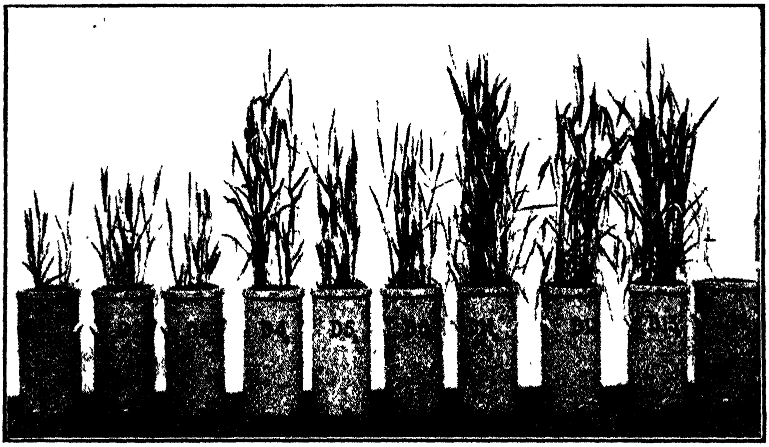


Fig. 18.—Influence of Fertilizers on Water Requirements of Wheat. View of Crops in early Spring.

Nitrogen appears to influence the relative proportion of roots to total dry matter to a greater extent than any other nutrient. An excess of either phosphoric potash or lime does not affect the percentage of roots compared with the corresponding controls. Where nitrogen is absent 7.2 per cent of the weight of the crop consists of roots. Where nitrogen alone is in excess, the percentage of root falls to 4.8 per cent., and in no case where excess nitrogen is used with excess of other fertilizers does the percentage of roots exceed 4 per cent. We may, therefore, conclude that the application of fertilizers, and in particular the application of heavy dressings of nitrates, decreases the proportion of roots to total dry matter.

3 Effect of Fertilizers on Transpiration Ratio.

It is clear from these results that liberal applications of fertilizers have a material effect on the Transpiration' Ratio.

Dressings of either nitrogen, phosphoric acid, potash, or lime lowered the Transpiration Ratio for dry matter as compared with the corresponding control plots in which these nutrients were absent.

Nitrogen produced the greatest relative reduction in the Transpiration Ratio for dry matter.

The unmanured controls produced crops with an average Transpiration Ratio of 377 for dry matter and 1355 for grain.

With normal dressings of nitrogen, phosphoric acid, potash, and lime the Transpiration Ratios were reduced to 292 for dry matter and 1216 for grain, compared with the unmanured control. With excess dressings of the same plant nutrients, the Transpiration Ratios were reduced to 270 and 871 for dry matter and grain respectively.

In other words, the unmanured controls gave a 29 per cent. higher water requirement than the normal dressing and a 39.6 per cent. higher water requirement than the complete heavy dressing. The Transpiration Ratios for grain for the unmanured controls were 11 per cent. and 55 per cent. higher than the corresponding ratios for a normal dressing and a complete heavy dressing

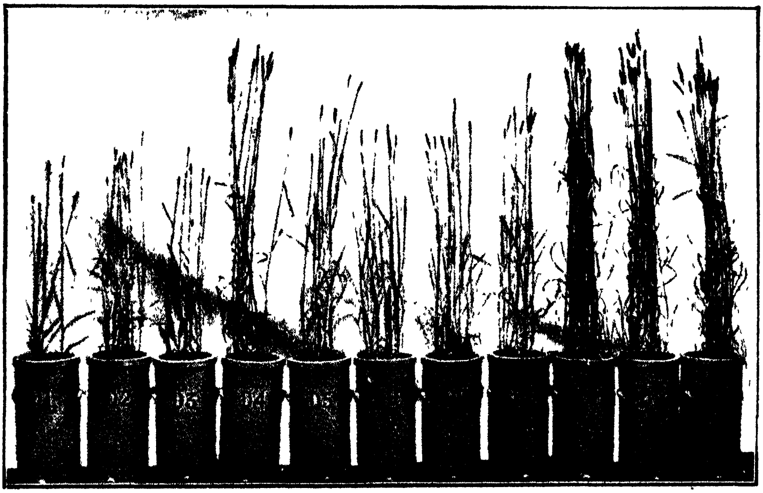


Fig. 19.—Influence of Fertilizers on the Water Requirements of Wheat. View of Matured Crops.

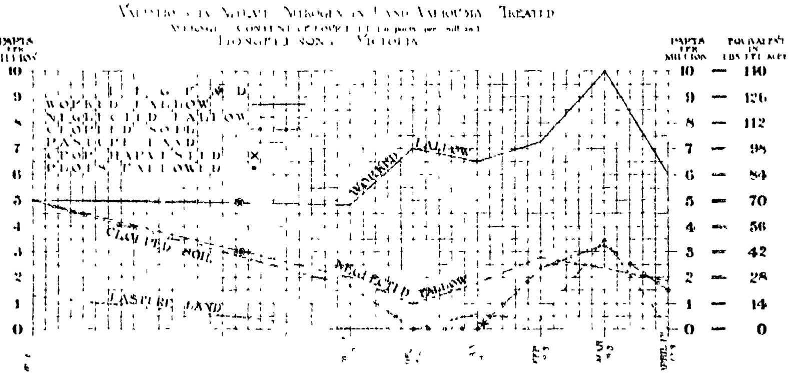
(1) Untreated. (2) Normal Dressing of Fertilizer (4) Excess of Nitrogen (11) Excess of Nitrogen and Phosphoric Acid

These results are of great practical significance. Fertilizers applied to soils, either naturally poor or deficient in any nutrient, not only greatly stimulate the yield, but appreciably lower the Transpiration Ratio for dry matter and grain.

The mineral constituent most lacking in Australian soils is phosphoric acid. Throughout the wheat belt of Australia the application of a relatively small amount of water soluble phosphoric acid, 60 to 100 lbs. per acre, has a most remarkable effect on the grain yield. On the other hand, nitrogen, although not abundant in our wheat soils, has little or no effect on the wheat yield. The explanation of this has been given in detail by the writer in a previous work (A. E. V. Richardson, "Wheat and its Cultivation," 1912). The wheat crop is usually preceded by a well-worked bare fallow. The aeration of the fallows as a result of frequent working, combined with the high moisture content of the fallows and the favorable summer temperatures, lead to rapid nitrification of the organic matter of the soil, with the result that at seed time the amount of available nitrates present in the soil is sufficient for all possible demands of the wheat crop.

The writer showed in the Bulletin cited above that a well-worked fallow at Longerenong, Victoria, contained 91.9 lbs. of nitrate nitrogen at seed time, as compared with 21.0 lbs in the non-fallowed land. In other words, the amount of nitrate nitrogen present in a well-worked fallow was more than four times as much as would be required by a 15-bushel wheat crop.

The following graph shows the fluctuation in the nitrate nitrogen content of the soil in well-worked fallow, neglected fallow, cropped soil, and pasture land during the summer and autumn months, on the Longerenong College Farm—a typical wheat area of Victoria



Potash is present in abundance in the majority of Australian soils Peaty and sandy soils alone show any response to potash manuring, and even on these the response to potash is only marked where root crops or legumes are grown. Lime is always present in quantities sufficient for the needs of crops, and is required in isolated cases only because of its effect on the soil texture and on soil acidity.

Phosphoric acid, however, is invariably the deficient mineral nutrient, and the limiting nutrient for crop production. Practical experience and field experiments have repeatedly demonstrated that only by the application of soluble phosphates can the wheat-grower secure the maximum yield the season and the soil will allow, and that the effect of phosphates is greater on fallowed than on stubble land.

The results of the tests described above suggest that, when nitrates are available in abundance (and in well-worked fallows a liberal supply of nitrates is assured), the addition of a soluble phosphate not only increases the vigour and size of the crop, but lowers the Transpiration Ratio and brings about a more effective use of the limited supplies of soil moisture.

4. EFFECT OF MANURES ON COMPOSITION OF PLANT.

The roots, straw, and grain from two pots of each of the thirteen series were carefully harvested, and the percentage of nitrogen, phosphoric acid, and potash in the respective portions of each crop was determined As the dry weight of root, straw, and grain produced from each pot was known, the total amount of nitrogen, phosphoric acid, and potash taken in by the plant throughout the period of growth could be determined.

As the total water used in each series had already been determined, it was possible to calculate from this data the amount of water required to bring a unit weight of nitrogen, phosphoric acid, and potash into each of the thirteen series of crops.

The analyses of the crops from two representative pots of the whole series are summarized in the following table —

TABLE XV

PERCENTAGES OF NITROGEN, PHOSPHORIC ACID, AND POTASH IN THE GRAIN, STRAW, AND ROOTS OF WHEAT GROWN ON SAND, TREATED WITH VARIOUS FERTILIZERS

No. of Plot	Nitrogen in —			Phosphoric Acid in			Potash in —		
	Straw	Grain	Roots	Straw	Grain	Roots	Straw	Grain	Roots
	%	%	%	%	%	%	%	%	%
Nil—									
D1$_1$	·266	1·59	68	·060	·920	·483	1·468	·527	·221
D1$_2$.	·242	1·63	1 01	069	1 016	·401	1·350	·549	200
Normal Dressing, N, P, K, Ca									
D2$_1$.	·215	1·39	67	·047	·714	·322	1·336	·482	·661
D2$_2$.	·242	1·34	69	·059	·837	·312	1·250	·478	·580
Deficiency N									
D3$_1$ ..	·266	1·64	·97	·098	·996	·307	1·458	·583	·306
D3$_2$.	270	1·52	·69	·105	·957	·210	1·257	·563	230
Excess N									
D4$_1$.	·566	2 88	1 07	·053	·479	·270	1·958	·374	·216
D4$_2$ ..	·543	2·75	·99	·042	·450	·315	1·710	·359	233
Deficiency P									
D5$_1$.	·266	1·35	·77	·083	·723	·315	1·397	·491	250
D5$_2$ ..	·269	1·49	·84	·078	·896	·395	1·590	·428	220
Excess P									
D6$_1$	·274	1·35	·76	·145	·939	·315	1·285	·531	151
D6$_2$.	·214	1·39	·70	·104	·980	·287	1·138	·442	·213
Deficiency K									
D7$_1$	·196	1·34	·67	·106	·801	·311	1·019	·486	·262
D7$_2$	·143	1·38	·56	·132	·915	·271	1·500	·492	·204
Excess K									
D8$_1$ ..	·243	1·30	·88	·075	·759	·245	1·509	·508	·238
D8$_2$ ..	·228	1·33	·70	·102	·852	·360	1·810	·463	·314
Deficiency CaO									
D9$_1$ ..	·266	1·32	·96	·133	·796	·250	1·536	·416	·311
D9$_2$ ..	·242	1·40	·61	·100	·928	·287	1·470	·391	281
Excess CaO									
D10$_1$ ..	·229	1·39	·76	058	·754	·177	1·407	·433	·256
D10$_2$ ..	·215	1·48	·60	·065	·530	·201	1·470	·521	273
Excess N and P									
D11$_1$.	·376	1·68	·84	·160	·747	·305	1·289	·420	·394
D11$_2$ ..	·314	1·63	·77	·100	·740	·250	1·080	·432	340
Excess N, P, K									
D12$_1$ ..	458	2·06	·76	·051	·528	·358	1·989	·356	515
D12$_2$ ..	·518	2 22	·92	·056	·598	·327	1 860	·389	·568
Excess N, P, K, CaO									
D13$_1$ ..	·402	1·76	·81	054	·512	·390	1·785	·397	·589
D13$_2$.	·382	2·06	·92	·048	·460	·337	1 847	·358	·517

Nitrogen has a greater influence on the composition of the plant than on other fertilizer applied. The application of heavy dressings of nitrogen produced marked increases in the nitrogen content of the straw in D11, D12, D13, and a great increase in D4 (where nitrogen was in excess in comparison with other nutrients).

Excess nitrogen produced a profound increase in the nitrogen content of the grain in Series D4, the grain of which averaged 2.81 per cent. of nitrogen, as compared with 1.61 per cent. of nitrogen in the unmanured controls, and 1.58 per cent. of nitrogen in the pots without nitrogen.

Substantial increases in the nitrogen content of the grain were obtained in D12, D13, D11, and the increases run parallel with the corresponding increases observed in the nitrogen content of the straw.

Heavy applications of phosphoric acid have only a slight effect on the composition of the straw and grain. A slight increase is observed in the phosphoric acid content of the grain, and a fairly substantial increase in the phosphoric acid content of the straw. The phosphoric acid content of the straw appears to vary with the relative proportions of potash, lime, and nitrogen applied.

If phosphoric acid is supplied to a soil deficient in either nitrogen, potash, or lime, the phosphate content of the straw is increased.

If phosphoric acid is added to soils well supplied with nitrogen, potash, and lime, the phosphate content of the straw is lowered.

Excess of nitrogen has a greater effect on the phosphate content of the grain than has phosphoric acid.

Without nitrogen, the grain averages .97 per cent. of phosphoric acid. With excess nitrogen the percentage of phosphoric acid in the grain is depressed to .46 per cent.. With excess applications of all four nutrients the phosphate content remains at .48 per cent.—less than half the phosphoric content of the unmanured plots, or the plots without nitrogen. The straw of wheat is relatively rich in potash. Excess dressings of potash materially increase the potash content of the straw, but do not materially affect the potash content of the grain

Excess nitrogen depresses the potash content of the grain, even in those cases where potash is present in abundance (D12, D13).

Excess of lime has the least effect of the four nutrients. It does not materially affect the percentages of nitrogen and potash content of the straw, grain, or roots, but slightly depresses the phosphate content of the plant, more especially of the straw and roots.

Looking at the results as a whole, the most significant changes in the composition of the plant are effected by nitrogen.

Heavy dressings of nitrates greatly increase the nitrogen content of the grain and straw of wheat. The increase in the nitrogen content of the grain is accompanied by a marked reduction in the phosphate content, and a lesser reduction in the potash content of the grain. Excess dressings of nitrogen also increase the potash content, and decrease the phosphoric acid content of the straw

The actual weight of nitrogen phosphoric acid, and potash taken in by the roots, straw and grain of the crops from each manurial application is summarized in the following table:—

TABLE XVI.

WEIGHTS OF NITROGEN, PHOSPHORIC ACID, AND POTASH IN THE GRAIN, STRAW, AND ROOTS OF WHEAT GROWN IN SAND, TREATED WITH VARIOUS FERTILIZERS.

No. of Plot.	Weight of Nitrogen in—				Weight of Phosphoric Acid in				Weight of Potash in—			
	Straw	Grain.	Roots.	Total Plant.	Straw.	Grain	Roots	Total Plant.	Straw	Grain.	Roots	Total Plant
	grms.	grms.	grms.	grms	grms.	grms.	grms	grms.	grms.	grms.	grms.	grms
Nil, N1												
D1	0334	·0696	·0171	·1201	0075	·0403	0122	0600	184	·0231	0055	2126
D1	·0287	·0675	·0169	·1134	0082	·0423	0067	·0572	·160	0229	0033	·1862
Normal dressing N, P, K, Ca—												
D2	0673	1326	0279	·2278	0147	·0681	0134	0962	418	0460	·0275	·4915
D2	·0820	·1277	0298	·2395	·0200	·0797	0135	1132	428	·0455	·0251	·4986
Deficiency N—												
D3	·0393	·1086	·0130	1609	0145	0660	0011	0846	2156	0386	·0041	·2583
D3	·0436	·0862	·0138	1436	·0170	0543	0092	0755	2034	0319	·0046	·2309
Excess N—												
D4 ..	·2985	5322	·0653	8960	0279	·0885	·0106	1270	1 0327	0691	·0084	1·1102
D4	·3413	6952	0404	1·0769	·0264	·1137	·0128	1529	1 0749	0907	·0095	1 1751
Deficiency PP—												
D5	·0802	·1268	·0250	·2320	0250	·0679	·0102	·1031	4213	·0461	·0081	.4755
D5	0809	·1326	·0143	·2278	0235	0797	0067	·1099	4783	·0381	·0037	·5201
Excess P—												
D6	·1019	·1351	0316	·2686	0540	0940	·0131	·1611	4781	0531	·0063	5375
D6	·0793	·1148	0262	2203	0385	0809	0107	1301	·4215	·0365	0079	·4659
Deficiency K—												
D7 .	0815	·1576	·0187	·2578	0441	0942	0087	1470	4238	·0571	·0073	·4882
D7 ..	·0401	·1160	0181	·1751	·0379	0769	0087	1235	4305	·0414	·0130	·4829
Excess K—												
D8 .	·0931	·1598	·0296	·2825	·0287	·0934	·0082	1303	5779	0624	·0080	·6488
D8	·0735	·1440	·0206	·2381	0328	·0923	·0106	1357	5832	·0501	·0092	6425
Deficiency CaO—												
D9	·0892	·1249	·0289	·2430	·0446	0753	0075	1274	5152	·0394	·0093	·5639
D9	·0697	1198	·0218	·2113	·0288	0794	·0102	·1184	·4235	0335	0100	·4670
Excess CaO												
D10 .	·0740	·1433	·0229	2402	·0187	·0777	·0053	·1017	4545	·0450	·0077	·5072
D10	·0763	1625	0261	·2649	0238	·0582	0087	0907	5220	·0572	0118	·5910
Excess N + P												
D11	·3805	·6635	·0412	1·0942	·1658	·2817	0150	·4625	1 3354	158	·0193	1 5127
D11 .	·4289	7403	0439	1 2131	1366	·3361	· 0142	·4869	1 4753	·196	·0194	1·691
Excess N, P, K—												
D12	4208	·8245	·0398	1·2852	0469	2117	0187	·2773	1 8273	143	0269	1 9972
D12	1607	·8822	·0509	1 3038	·0498	2376	·0181	·3055	1 6544	·154	·0314	·1840
Excess N, P, K, Ca												
D13	·4002	·7939	0466	1 2407	0538	2309	0224	3071	1 7743	179	0339	1·9872
D13	·3792	·8357	·0541	1 2690	0476	1866	0198	2540	1 8335	145	0304	2 0099

The total intake of the mineral nutrients was thus determined, and as the water transpired throughout the whole period of growth was already known, it was possible to determine the amount of water required to bring in a unit weight of each mineral nutrient into the plant.

The amount of water required to bring into the plant a gram of nitrogen phosphoric acid and potash might be called the Transpiration Ratio for these nutrients. If these solutes were presented to the plant in a solution of unvarying concentration throughout the period of growth, the average concentration of the solutes in parts per million would range from 17 to 42 parts per million for nitrogen, 6 to 11 parts per million for phosphoric acid, and 36 to 54 parts per million for potash

The amount of water required to bring into each series of crops a unit weight of nitrogen, phosphoric acid and potash, and the average concentration of the soil solutes for each manurial dressing are summarized in the following table:—

TABLE XVII.

TRANSPIRATION RATIO FOR NITROGEN, PHOSPHORIC ACID, AND POTASH, AND AVERAGE CONCENTRATION OF THE MINERAL INTAKE IN PARTS PER MILLION FOR WHEAT GROWN ON SAND AND TREATED WITH VARYING QUANTITIES OF NUTRIENTS.

Series	Treatment	Water transpired.	Transpiration Ratio		Total Dry Matter.	Transpiration Ratio for—			Average concentration of mineral solutes in parts per million.		
			Straw and Grain	Grain		N	P_2O_5.	K_2O.	N.	P_2O_5.	K_2O
		lbs.			grms.						
D1	No manure .. .	12·77	375	1348	17·49	47,680	94,790	27,900	21	10	36
D2	N, P, K, Ca—Normal dressing	25·58	292	1216	46·39	49,490	111,170	23,360	20	9	43
D3	P, K, Ca—No Nitrogen	15·78	348	1178	23·30	47,240	89,860	28,790	21	11	35
D4	P, K, Ca—Excess Nitrogen	51·43	302	1070	83·67	23,580	165,900	20,370	42	6	50
D5	N, K, Ca—No Phosphoric Acid	25·42	306	1259	42·70	50,070	108,250	23,180	20	9	43
D6	N, K, Ca—Excess Phosphoric Acid	28·97	278	1298	51·20	54,320	91,810	26,380	18	11	39
D7	N, P, Ca—No Potash .	28·02	292	1246	48·23	58,270	92,730	26,070	17	11	39
D8	N, P, Ca—Excess Potash	27·96	283	1092	49·97	48,590	95,490	19,660	21	10	51
D9	N, P, K—No Lime ..	26·04	311	1314	43·48	52,170	96,080	23,090	19	10	43
D10	N, P, K—Excess Lime..	27·86	296	1184	48·23	49,910	132,120	22,980	20	8	43
D11	K, CaO—Excess Nitrogen and Phosphoric Acid	106·95	304	1160	166·96	42,130	102,200	30,320	24	10	33
D12	CaO—Excess Nitrogen, Phosphoric Acid, and Potash	88·89*	309	1012	135·69	30,110	138,660	21,030	33	7	47
D13	Excess Nitrogen, Phosphoric Acid, Potash, and Lime	82·20	270	871	148·08	29,690	138,150	18,640	34	7	54

In the unfertilized soil the amount of water required to bring in a unit weight of nitrogen, phosphoric acid and potash is as follows:—

Nitrogen .	47,680 parts water
Phosphoric acid	94,790 ,, ,,
Potash .	27,900 ,, ,,

This corresponds to an average concentration of the nutrients absorbed by the wheat throughout its growth, of 21 parts of nitrogen, 10 parts phosphoric acid, and 36 parts of potash per million parts of water, or a total of 67 parts of mineral nutrients per million parts of water absorbed and transpired. The most profound effect on the total concentration of the nutrient intake is brought about when nitrogen is present in excess quantities as compared with other nutrients. Where excess nitrogen is used (D4) the average concentration of the nitrogen intake is double (42 parts per million) that of the unmanured control, while the average concentration of the potash intake is increased to 50 parts per million. The total nutrient concentration for excess dressings of nitrogen is 96 parts per million On the other hand, excess dressings of phosphoric acid do not appear to materially affect the total nutrient intake, though the phosphoric acid intake is slightly increased and the nitrogen intake decreased. Excess potash increases both the total nutrient intake and the proportion of potash absorbed, but, on the other hand, it lowers the proportion of phosphoric acid absorbed.

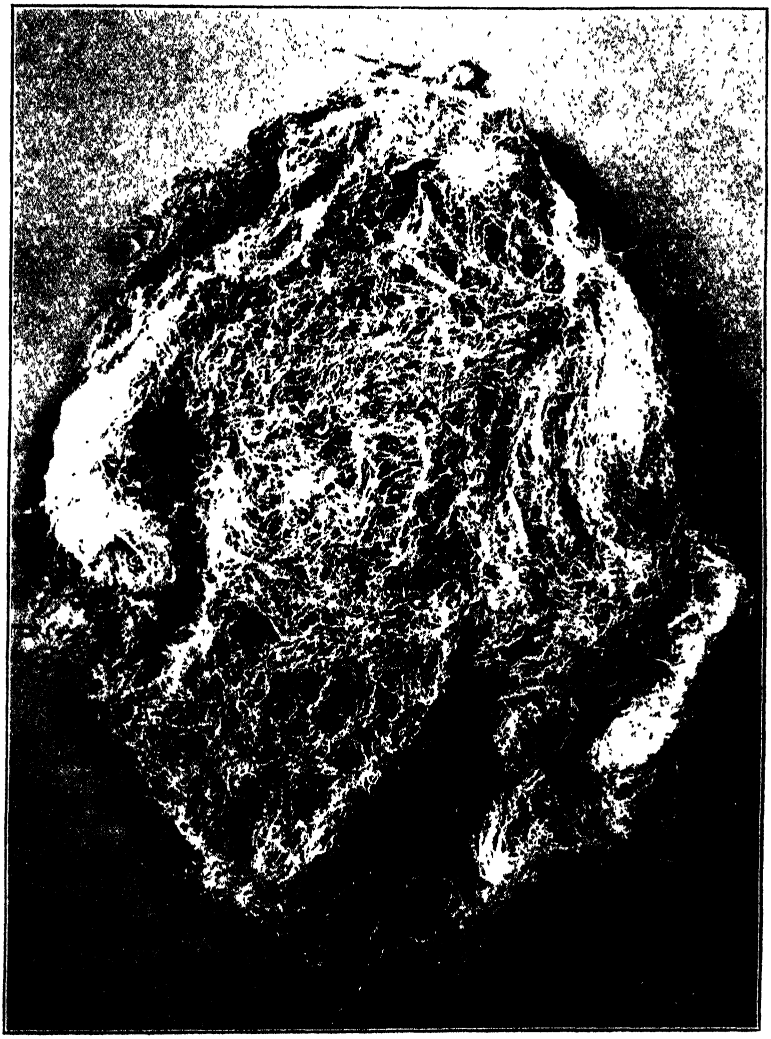


Fig. 20.—Roots of Wheat Plants Extracted from Pot Maintained Throughout Growth at 30% of Water-holding Capacity.

Comparing the D2 series of pots—a normal dressing of all nutrients-with the D14 series—excess dressing of all nutrients—it will be noted—

1. That the total nutrient intake is increased from 72 parts to 95 parts per million parts of water absorbed.
2. The proportion of nitrogen and potash is materially increased whilst the proportion of phosphoric acid is lowered.

The concentration of the intake does not necessarily reflect the average concentration of the soil solution in respect to these mineral nutrients, because different plants grown on the same soil would show very different relative values for intake of mineral nutrients because of the characteristic selective action, and varied requirements of each species of plant.

Moreover, there is reason to believe that the average concentration of the mineral intake during the early stage of a plant's growth may be higher than during the later stages. This is suggested from some results obtained in this Department by Robertson and Ramsay (Department of Agriculture, Victoria Bulletin No. 39) with potatoes. From a review of the analyses of a potato crop at different stages of maturity, it was shown that potatoes took up during the first fifty-eight days of growth approximately 75 per cent. of the nitrogen, phosphoric acid, and potash required, though during this period only one-half of the total dry matter had been formed. The period of maximum transpiration for farm crops, including potatoes, occurs when the plants approach the flowering stage. It would appear, therefore, that the potato crop must absorb less mineral nutrient and proportionately more water in the final stages of its growth. In view of these considerations, it does not seem possible to make use of the transpiration ratio, as Lyon and Bizzel (1913) have suggested, as a means of determining the relative density of the soil solution in different types of soil

(*To be continued.*)

POTATO GROWING.*

We are in receipt of a copy of a little book on Potato Growing by Mr. Geo. Seymour. The work supplies much information regarding methods, together with numerous statistics bearing on the industry.

The author is a recognised authority on the subject, which is dealt with in a practical manner, and in terms which are easily understood by tyro and expert alike

The publication deserves success, and should be of great interest and value to those engaged in the industry.

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* *Potato Growing in Australia* (Whitcombe and Tombs Ltd., 189 Little Collins-street, Melbourne), 2s. 6d., posted 2s. 9d.

REGISTRATION OF STALLIONS.

Third Annual Report under the Horse Breeding Act 1919.

W. A. N. Robertson, B.V.Sc., Chief Veterinary Inspector.

During the past season, the third in which the Horse Breeding Act has been in operation, some degree of dissatisfaction was expressed at the provisions of the Act, and the pessimist -usually one who had had the misfortune to have a stallion rejected--has raised his voice loudly in complaint that the horse-breeding industry has been ruined.

The grounds upon which such an assertion is made are that alleged good horses which have been refused registration are being sent to adjoining States, that the type, especially amongst draughts, is deteriorating, and that stallion owners are being forced out of business.

If the Horse Breeding Act is indeed responsible, then the position in the adjoining States, where there is no legislation, ought to be very favorable and the industry be on a sound basis Inquiry does not reveal that this is so, but rather the reverse, and those who are in a position to judge are seeking a means, in New South Wales at least, to improve the situation which has arisen, and are pressing for the introduction of legislation similar to that in operation in Victoria. Critics within our own boundaries, who discuss the question usually from personal rather than the national view-point, overlook one important consideration The Act has been in operation for only three years. Consequently progeny, the result of matings during the first year the Act was in force, are only this season's two-year-olds. Therefore it must be some years before any valuable deduction can be made as to the effect the Act will have upon type of horses bred.

A general survey of the position may throw some light upon the matter, especially with regard to the alleged dearth of draught stallions in the State and what has been responsible for the shortage.

Consideration of the subject raises the question—What has become of the old school of draught-horse breeder, who took such a pride in breeding good stock? Some of them unfortunately have passed away Many have retired from the business for one of two reasons. Quite a number, having acquired sufficient means on which to lead a quiet life, have left the country, and probably find a motor car the most convenient means of travelling. Others not so fortunate have ceased to keep a stallion, because during the war there was difficulty in obtaining reliable grooms, and because following boom periods draught horses were so plentiful that values fell to a point at which breeding became unprofitable. This fall in value was largely due to legislation not having been enacted earlier, whereby rejected stallions could have been put out of commission. Thus uncertificated stallions were standing at a low service fee, and so the keeping of a thoroughly sound stallion became much less profitable than it should have been.

These handicaps were undoubtedly the cause of some of the older school dropping out, and preferring a less troublesome old age, they now hesitate to re-enter the business.

We may next ask—Why has the succeeding generation not stepped into the breach? This may be answered largely by saying that the greater number have acquired properties of their own, and are not yet sufficiently well-established to give serious attention to the problem They are content to assume that the risk of having a stallion rejected after the first year's registration is too great for them to undertake This leads us to a consideration of what is the risk.

In 1920-21 forty-six three-year-old draughts were granted certificates; the following year four of these were refused certificates as four-year-olds. In the same year fifty-four four-year-olds were registered, and as five-year-olds nine of them were turned down. In 1921-22 seventy-three three-year-olds were registered, and as four-year-olds six of them were last year refused registration, while of forty-five four-year-olds certificated in 1921-22 three were rejected last year.

It must, therefore, be admitted that there is a risk, but it is not nearly so formidable as the pessimist would have us believe, and that the risk is gradually being seen at its true value was indicated at the last stallion sales when practically every horse offered for sale changed hands at a satisfactory figure. As hereditary unsoundness is eliminated, the chance of loss will be minimized, if it does not totally disappear, with the enacting of legislation. But in order that owners who are unfortunate in this respect may be compensated, the Minister of Agriculture has promised that a Bill to provide for insurance against the non-certification of stallions will be brought down next session.

During the 1921-22 season the total number of stallions eligible for registration for which applications were lodged was 1,570, and last season the number was 1,748, an increase of 178. The number of draught horses examined in 1921-22 was 311, and last year 347, an increase of 36. This increase was more than accounted for by the number of three-year-olds brought forward, there being 134 as against 89 the previous year, an increase of 45. Such figures are a clear indication that horse-breeding is slowly and surely coming back into its own, and the gradual removal of rejected stallions, which brought about the collapse, is steadying the market and making the business of rearing horses a lucrative one to an increasing number of young men, who are willing to take the risk with the belief that ultimately Victoria's lead over other States will be firmly established.

Analyses of Rejections.

During last season 252 parades were conducted by examining officers At these a total of 637 stallions was submitted for examination. Of this number 456 were pronounced sound and of approved type and were registered. As 1,109 over five years of age were registered without examination it means that last year 1,565 registrations were made. As in previous years the majority of horses examined were draughts. Of the 347 submitted, 83, or 23.9 per cent., were rejected, a fall of 8 per cent. from the previous year.

Thirty-six, or 10.3 per cent. of all the stallions presented, were rejected as being below a reasonable standard, while 47, or 13.5 per cent., were found unsound. This is an appreciable fall on the figures of the previous year when 19.6 per cent. were rejected on the ground of unsoundness.

The unsoundness mainly responsible for rejections in the case of draught horses was, as usual, sidebones, which accounted for 12.1 per cent., and here a satisfactory fall is noted from 16.7 per cent. in 1921-22. If such improvement can be maintained, it will not be many years before the risk in buying a draught horse will be negligible. The table hereunder shows the rejections for other forms of unsoundness, which are so light as not to call for comment Amongst light horses 21, or 11 per cent , were found unsound; bone spavin and ringbone were responsible for the major portion. Of the hundred ponies examined, only one was found unsound, the unsoundness being due to ringbone

TABLE SHOWING DETAILS OF EXAMINATIONS.

—	Draught		Light.		Pony.		Total.	
	Examined 347	Certificated. 264	Examined. 190	Certificated. 126	Examined 100	Certificated. 66	Examined. 637	Certificated 456
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected	Rejected	Per cent. Rejected.	Rejected	Per cent Rejected
Bog Spavin ..			2	1·05	..	.	2	·31
Bone Spavin ..	1	·28	8	4·21			9	1·41
Curb			3	1·57			3	·47
Ringbone .	3	·86	7	3·68	1	1·00	11	1·72
Sidebone ..	42	12·10		.	.	.	12	6·59
Roaring ..	1	·28	1	·52		.	2	·31
Through unsoundness ..	47	13·54	21	11·05	1	1·00	69	10·83
Through disapproval ..	36	10·37	43	22·63	33	33·00	112	17·58
Total .	83	23·91	64	33·68	34	34·00	181	28·41

Appeals.

Twenty appeals were lodged against the decisions of the veterinary officers. In each of nineteen of these cases the reason for rejection was, "disapproval—the horse was 'below standard'" The remaining one combined the twofold basis for rejection, "unsoundness" and "below standard." The Boards appointed to consider the appeals upheld in eighteen cases the veterinary officer's decision, and in two reversed it and granted certificates.

Parades for Coming Season.

The time-table of parades for the coming season published on pages 287-292 has been arranged so that every centre in the State may if required be visited. Owners of stallions should study the schedule of parades, and having decided at which they will present their stallion, insert the name of that place in the space provided therefor in the form of application for registration.

It will not necessarily follow that because a parade is listed in the schedule that a veterinary officer will attend there In fact, if no owner has notified his intention of presenting his horse there, an officer will not attend. If a parade be not held on the date set down, it may be impossible to arrange for a second one until after the season has opened, as the Veterinary Staff will be fully engaged right up to the time of the Royal Show.

Application for registration should be made before the 1st July, and if owners comply with all requirements the veterinary officers will be prepared to inform them of the result of the examination on parade day

Forms of application may be obtained from secretaries of Agricultural Societies and from the officer in charge of all police stations, to whom I desire to again record my thanks for assistance during the past year.

All registrations except those made after the 1st April of this year automatically terminate on 30th June next. Owners should carefully note that if a stallion changes ownership in any way the registration will expire within thirty days, unless due notice is given and the certificate of registration suitably indorsed.

STALLION PARADES

TIME TABLE, 1923-24.

Provided that the applications for registration received indicate that a horse will be in attendance there for examination, a parade will be held at each of the following places:—

No and Date	Parade	Time	Officer Arrives	Officer Departs
No 1.				
Monday, June 25	Dunolly	1.41 p m.	1.41 p.m	3.35 p.m
Monday, June 25	Maryborough	4 30 p.m.	4.30 p.m	10.18 p.m
Tuesday, June 26	Mildura	2 p.m.	8 a.m	7.35 a.m. (27th)
Wednesday, June 27	Ouyen	10 a.m	9.55 a.m	Driving
Wednesday, June 27	Walpeup	12 noon	Driving	Driving
Wednesday, June 27	Underbool	2 p.m.	Driving	Driving
Wednesday, June 27	Tutye	3.30 p.m.	Driving	Driving
Wednesday, June 27	Murrayville	4.30 p.m.	Driving	Driving
No. 2.				
Monday, June 25	St. Arnaud	3.30 p.m	3.22 p.m	12 9 a.m. (26th)
Tuesday, June 26	Speed	9 a.m.	4.16 a.m.	11.1 a.m.
Tuesday, June 26	Woomelang	11.53 a.m	11.53 a.m.	12.3 p.m. (27th)
Wednesday, June 27	Watchem	1.30 p.m.	1.32 p.m.	6.52 p.m.
Thursday, June 28	Curyo	9 a.m.	Driving	Driving
Thursday, June 28	Birchip	11 a.m.	Driving	1.5 p.m.
Thursday, June 28	Donald	2.30 p.m.	2.13 p.m.	5.55 a.m (29th)
No. 3.				
Tuesday, June 26	Sea Lake	10 a.m.	7.40 p.m. (25th)	Driving
Tuesday, June 26	Nandaly	12 noon	Driving	Driving
Tuesday, June 26	Kulwin	3 p.m.	Driving	Driving
Wednesday, June 27	Culgoa (Railway Station)	9 a.m.	Driving	9.54 a.m.
Wednesday, June 27	Wycheproof (Railway Station)	11.40 a.m	11.40 a.m.	12.25 p.m
Wednesday, June 27	Charlton (Railway Station)	1.22 p m	1.22 p.m.	1.43 p.m.
No. 4.				
Tuesday, July 3	Dimboola	9.30 a.m.	6.5 p.m. (2nd)	11.45 a.m
Tuesday, July 3	Rambow	2.45 p.m.	2.45 p.m.	3.50 p.m
Tuesday, July 3	Yaapeet	4.40 p.m.	4.40 p.m.	5.30 p.m
Wednesday, July 4	Kaniva	2 p.m.	2.28 a.m	12.42 a.m. (5th)
Thursday, July 5	Jeparit (Railway Station)	10.8 a.m	10.8 a.m	10.55 a m
Thursday, July 5	Lorquon (Railway Station)	11.50 a m	11.50 a.m.	12.5 p m
Thursday, July 5	Yanac (Railway Station)	1.20 p.m.	1.20 p.m.	1.40 p.m
No. 5.				
Tuesday, July 3	Goroke	3 p.m.	1.15 p.m	6 p.m.
Wednesday, July 4	Horsham	9 a.m.	9.5 p.m. (3rd)	5.50 p.m
Thursday, July 5	Natimuk	10 a.m.	7 p.m. (4th)	Driving
Thursday, July 5	Toolondo	12 noon	Driving	Driving

STALLION PARADES, TIME TABLE—*continued.*

No. and Date	Parade	Time	Officer Arrives	Officer Departs
No. 6.				
Tuesday, July 3	Hopetoun	11 a.m.	9.40 p.m. (2nd)	7.20 a.m. (4th)
Wednesday, July 4	Warracknabeal	2 p.m.	10 a.m.	7.30 p.m.
Thursday, July 5	Beulah	9.30 a.m.	9.20 p.m. (4th)	11.45 a.m.
Thursday, July 5	Minyip	3 15 p.m.	3 10 p.m.	11.45 a.m. (6th)
Friday, July 6	Murtoa (Railway Station)	12 35 p.m.	12.35 p.m.	1.10 p.m.
No. 7				
Monday, July 2	Ballan	10.15 a.m.	10 a.m.	12.2 p.m.
Monday, July 2	Bacchus Marsh	1 p.m.	12.34 p.m.	Driving
Monday, July 2	Melton	3 p.m.	Driving	8.50 p.m.
Tuesday, July 3	Riddell	11 a.m.	8 13 a.m.	2.46 p.m.
No. 8				
Monday, July 9	Mitiamo (Railway Station)	1.37 p.m.	1 37 p.m.	1.53 p.m.
Monday, July 9	Pyramid (Railway Station)	2.30 p.m.	2.30 p.m.	7.10 a.m. (10th)
Tuesday, July 10	Raywood	11 a.m.	9.18 a.m.	12 50 p.m.
Tuesday, July 10	Tandarra	1.5 p.m.	1.4 p.m.	4.42 p.m.
Wednesday, July 11	Bendigo	10 a.m.	6.10 p.m. (10th)	12.12 p.m.
Wednesday, July 11	Marong	1 p.m.	12.41 p.m.	5.13 p.m.
Thursday, July 12	Maldon	11.45 a.m.	11.37 a.m.	Driving
Thursday, July 12	Shelbourne	1.30 p.m.	Driving	Driving
Thursday, July 12	Castlemaine	3.40 p.m.	3.40 p.m.	8.38 p.m.
Friday, July 13	Newstead	10.30 a.m.	9.12 p.m. (12th)	11.31 a.m.
No. 9				
Monday, July 9	Rupanyup (Railway Station)	4.40 p.m.	4.40 p.m.	5.5 p.m.
Tuesday, July 10	Marnoo	9.30 a.m.	6 25 p.m. (9th)	11 a.m.
Tuesday, July 10	Lubeck (Railway Station)	1.20 p.m.	1.20 p.m.	1.30 p.m.
Tuesday, July 10	Ararat	3.45 p.m.	3 30 p.m.	8 36 a.m. (11th)
Tuesday, July 11	Stawell	10 a.m.	9.25 a.m.	2.34 p.m.
Thursday, July 12	Avoca	9 30 a.m.	8 20 a.m.	Driving
Thursday, July 12	Navarre	11.30 a.m.	Driving	Driving
No. 10				
Monday, July 9	Macorna	3 p.m.	2.55 p.m.	9.17 p.m.
Tuesday, July 10	Koondrook	9.30 a.m.	Driving	Driving
Tuesday, July 10	Kerang	2 p.m.	Noon	3.55 p.m.
Wednesday, July 11	Nyah	9 a.m.	Driving	Driving*
Wednesday, July 11	Piangil	9 30 a.m.	Driving	Driving
Wednesday, July 11	Manangatang	11 a.m.	Driving	Driving
Wednesday, July 11	Chillingollah	Noon	Driving	Driving
Wednesday, July 11	Ultima	3 p.m.	Driving	Driving
Wednesday, July 11	Lalbert	4 p.m.	Driving	Driving
Thursday, July 12	Swan Hill	10 a.m.	Driving (11th)	12 noon

STALLION PARADES, TIME TABLE—*continued*.

No. and Date.	Parade	Time.	Officer Arrives.	Officer Departs
No 11.				
Monday, July 16	Royal Show Grounds	10 a.m.		
No. 12.				
Monday, July 23	Tungamah	1.30 p.m.	1.21 p.m	3.21 p.m.
Monday, July 23	Devenish	4 p.m.	4 p.m.	8.37 p.m.
Tuesday, July 24	Yarrawonga	11 a m.	10 p.m. (23rd)	2.45 p.m.
Wednesday, July 25	Benalla	9 30 a m.	5 10 p m (24th)	11.25 a.m.
Wednesday, July 25	Rutherglen	2 p.m.	1.53 p.m.	7.50 a.m. (26th)
Thursday, July 26	Chiltern	2 p.m.	1.13 p.m.	3.45 p.m.
No 13.				
Monday, July 23	Tallangatta	4 p.m.	3.53 p.m.	Driving (24th)
Tuesday, July 24	Corryong	12.30 p.m.	Driving	6 a.m. (25th)
Wednesday, July 25	Wodonga (Railway Station)	12 45 p m.	12.45 p.m	3.5 p.m.
No. 14				
Wednesday, July 25	Inglewood	11 a.m.	10.2 p m. (24th)	1.29 p.m.
Wednesday, July 25	Boort	4.26 p.m.	4.26 p.m.	5 p.m.
Thursday, July 26	Quambatook	10 a.m.	6.23 p.m. (25th)	11.5 a.m.
Thursday, July 26	Korong Vale	2.32 p.m.	2.32 p.m.	3.25 p.m.
Friday, July 27	Wedderburn Junction	2.8 p.m.	2.8 p.m.	3.39 p.m
No. 15.				
Monday, July 30	Kyabram	1.30 p.m.	12.32 p.m.	Driving
Monday, July 30	Tongala	3 p.m.	Driving	4.12 p.m.
Tuesday, July 31	Tatura	10.30 a.m.	5.30 p.m. (30th)	11.37 a.m.
Tuesday, July 31	Echuca	1.45 p.m.	1.45 p.m.	3.45 p.m.
Tuesday, July 31	Rochester	4.30 p.m.	4.25 p.m.	9.3 a.m. (1st)
Wednesday, August 1	Elmore	11 a.m.	9.40 a.m.	12.57 p.m.
Wednesday, August 1	Bamawm	3 p.m.	Driving	Driving
Thursday, August 2	Gunbower	4 p.m.	4 p.m.	Driving
Friday, August 3	Cohuna	11 a.m.	Driving	12.10 p.m
No. 16.				
Monday, July 30	Moyhu	2 p.m.	Driving	Driving
Monday, July 30	Whitfield	4 p.m.	Driving	Driving
Tuesday, July 31	Wangaratta	11 a.m.	Driving	12.39 p.m.
Tuesday, July 31	Bright	4.7 p.m.	4.7 p.m.	6.4 a.m. (1st)
Wednesday, August 1	Myrtleford	2 p.m.	7.12 a.m.	7.12 a.m. (2nd)
Thursday, August 2	Beechworth	11 a.m.	9.50 a.m.	12.51 p.m.
Thursday, August 2	Everton	2 p.m.	1.11 p.m.	3.30 p.m.
Friday, August 3	Euroa	10 a.m.	6.33 p.m. (2nd)	11.10 a.m.
Friday, August 3	Seymour	1 p.m.	12.8 p.m.	8.15 p.m.

STALLION PARADES, TIME TABLE—*continued.*

No and Date	Parade	Time	Officer Arrives	Officer Departs.
No 17				
Monday, July 30	Dookie (Railway Station)	12.48 p.m.	12.48 p.m	1.3 p.m
Monday, July 30	Katamatite (Railway Station)	2.8 p.m.	2.8 p.m.	2.55 p.m.
Tuesday, July 31	Nagambie (Railway Station)	9 a.m.	7.34 p.m. (30th)	9.59 a.m.
Tuesday, July 31	Shepparton	2 p.m.	11.18 a.m.	8.26 p.m.
Wednesday, August 1	Numurkah	11 a.m.	9.32 p.m. (31st)	12.38 p.m.
Wednesday, August 1	Strathmerton	1.10 p.m.	1.10 p.m.	1.20 p.m.
Wednesday, August 1	Cobram	2 p.m.	1.57 p.m.	3.10 p.m.
Thursday, August 2	Nathalia	2 p.m.	1.37 p.m.	3.26 p.m
Friday, August 3	Murchison	10 a.m.	7.3 p.m. (2nd)	10.45 a.m.
Friday, August 3	Rushworth	11.48 a.m.	11.48 a.m.	12.25 p.m
Friday, August 3	Colbinabbin	1.30 p.m.	1.20 p.m.	2.30 p.m.
No. 18				
Monday, August 6	Heathcote	2 p.m.	11.30 a.m.	6.23 p.m.
Tuesday, August 7	Alexandra	2 p.m.	12.30 p.m.	4.15 p.m.
Wednesday, August 8	Yea	9.30 a.m.	6.28 p.m. (7th)	10.38 a.m
Wednesday, August 8	Mansfield	2 p.m.	1.55 p.m.	3.30 p.m.
Thursday, August 9	Kilmore	9 a.m.	8.30 a.m. (driving)	9.40 a.m
No. 19				
Tuesday, August 7	Casterton	11 a.m.	7.55 p.m. (6th)	Driving
Tuesday, August 7	Coleraine	3 p.m.	Driving	Driving
Wednesday, August 8	Edenhope	12 noon	Driving	Driving
Wednesday, August 8	Harrow	2 p.m.	Driving	Driving
Wednesday, August 8	Balmoral	3 p.m	Driving	Driving
No. 20				
Tuesday, August 7	Dartmoor	11 a.m.	9 p.m. (6th)	9.55 a.m. (8th)
Wednesday, August 8	Heywood	11.45 a.m.	11.45 a.m.	12.15 p.m.
Wednesday, August 8	Portland	1.30 p.m.	1.5 p.m.	8.30 a.m. (9th)
Thursday, August 9	Branxholme	11.15 a.m.	11.15 a.m.	11.52 a.m.
Thursday, August 9	Dunkeld	1.30 p.m.	1.30 p.m.	3.53 p.m.
Thursday, August 9	Hamilton	4.33 p.m.	4.33 p.m	Driving (10th)
Friday, August 10	Cavendish	10 a.m.	Driving	Driving
No. 21.				
Monday, August 13	Dean's Marsh	11.35 a.m.	11.35 a.m.	2.40 p.m.
Monday, August 13	Birregurra	3.5 p.m.	3.5 p.m.	7.55 p.m.
Tuesday, August 14	Colac	10 a.m.	8.22 p.m. (13th)	11.15 a.m.
Tuesday, August 14	Gellibrand (Railway Station)	12.54 p.m.	12.54 p.m.	Continues journey by same train
Tuesday, August 14	Beech Forest	2.30 p.m.	2.30 p.m.	3.10 p.m.
Wednesday, August 15	Laver's Hill	10 a.m.	5.20 p.m. (14th)	12.10 p.m
Thursday, August 16	Winchelsea	10 a.m.	7.51 p.m. (15th)	11.10 a.m.

STALLION PARADES, TIME TABLE—*continued.*

No. and Date	Parade.	Time.	Officer Arrives.	Officer Departs
No. 22.				
Monday, August 13	Beaufort	2 p.m.	12.35 p.m	6.40 p.m.
Tuesday, August 14	Willaura	10 a.m.	8.15 a.m.	2.19 p.m.
Tuesday, August 14	Maroona	2.45 p.m.	2.45 p.m	3.15 p.m.
Wednesday, August 15	Nhill	3 p.m.	1.31 a.m.	1.32 a.m. (16th)
No 23				
Monday, August 13	Port Fairy	4 p.m	3.36 p.m	5.42 a.m. (14th)
Tuesday, August 14	Koroit	11 a.m.	6.25 a.m.	Driving
Tuesday, August 14	Hawkesdale	2 p.m	Driving	3.27 p.m.
Tuesday, August 14	Penshurst	4 11 p.m.	4.11 p.m.	7.32 a.m. (15th)
Wednesday, August 15	Warrnambool (Railway Station)	10.15 a.m	10 15 a m	10.55 a.m
Wednesday, August 15	Terang	12 30 p.m	12.5 p.m.	1 30 p.m
Wednesday, August 15	Mortlake	2.5 p m.	2.5 p.m.	Driving
Thursday, August 16	Camperdown	11 a.m.	5.35 p.m (15th)	12.25 p.m
Thursday, August 16	Timboon	2 10 p.m.	2 10 p m	2.55 p m
Thursday, August 16	Cobden	3.55 p m.	3.55 p.m	Driving
Friday, August 17	Werribee	11 47 a m.	11 47 a m	1.16 p.m.
No 24				
Monday, August 20	Drysdale	11 a m	9.35 a.m	4.6 p m.
Tuesday, August 21	Meredith	10 a.m	9.42 a.m	11.13 a.m
Tuesday, August 21	Bannockburn	2 p m	11.38 a m	4.23 p.m
Wednesday, August 22	Lismore	12 noon	11.55 a.m	Driving
Wednesday, August 22	Vite Vite	2 p m	Driving	4 52 p m
Thursday, August 23	Cressy	10.30 a m.	6 12 p m (22nd)	11 5 a.m
Thursday, August 23	Westmere	2 p.m.	1 17 p m	4.7 p.m.
Friday, August 24	Inverleigh	10 a m	9 53 a m	Driving
Friday, August 24	Geelong	2 p m.	12 10 p.m	5.55 p.m.
No 25				
Monday, August 20	Daylesford	Noon	11 59 a m	2 25 p m
Tuesday, August 21	Waubra	10 a m	Driving	Driving
Tuesday, August 21	Linton	2 p m	Driving	Driving
Tuesday, August 21	Skipton	3 p.m.	Driving	Driving
Wednesday, August 22	Clunes	11 a.m.	8.50 a.m	1.43 p.m
Wednesday, August 22	Creswick	2.30 p.m.	2.16 p m	Driving
Wednesday, August 22	Kingston	3 30 p.m	Driving	6.13 p.m.
Thursday, August 23	Kyneton	10 a.m.	9.10 a.m	Driving
Thursday, August 23	Redesdale	2 p.m	Driving	Driving
No 26				
Monday, August 20	Morwell (Railway Station)	11.57 a m.	11 57 a.m	12 15 p m
Monday, August 20	North Mirboo	3 p.m.	1.50 p.m	4.15 p.m.
Tuesday, August 21	Traralgon	10 a.m.	9.2 p m. (20th)	12.20 p.m.
Tuesday, August 21	Sale	2 p m	1.26 p m	6 20 a m (22nd)
Wednesday, August 22	Maffra	9 a.m.	7.14 a.m.	11.8 a.m.
Wednesday, August 22	Cowwarr	2 p.m.	1.15 p.m.	5.1 p.m.
Thursday, August 23	Trafalgar	10 a.m.	6.51 p.m. (22nd)	11.16 a.m.
Thursday, August 23	Moe	Noon	11.31 a.m.	6.39 p.m.

STALLION PARADES, TIME TABLE—*continued.*

No. and Date	Parade	Time	Officer Arrives	Officer Departs
No 27				
Monday, August 27	Warragul	10.12 a m.	10.12 a.m.	11.5 a.m.
Monday, August 27	Neerim South	3 p.m.	12.20 p.m	5.30 p.m.
Tuesday, August 28	Bunyip	10 a.m.	9.38 a.m.	11.25 a.m.
Tuesday, August 28	Pakenham	12 noon	11.54 a.m.	Driving
Tuesday, August 28	Berwick	3 p.m.	Driving	9.19 p.m.
Wednesday, August 29	Cranbourne	11 a.m.	8.2 a.m.	6.16 p.m.
Thursday, August 30	Woolamai	9.30 a.m.	8.35 p.m. (29th)	10.8 a.m.
Thursday, August 30	Wonthaggi	2 p.m.	10.55 a.m.	4 p.m
Friday, August 31	Lang Lang	9.15 a.m.	6.16 p.m (30th)	9 53 a.m.
Friday, August 31	Dandenong	11.30 a.m.	11 20 a.m.	12 39 p.m
No 28				
Monday, August 27	Korumburra	10.30 a m.	10.27 a.m	Driving
Monday, August 27	Leongatha	2 30 p.m	Driving	11 3 a.m (28th)
Tuesday, August 28	Yarram	3.30 p.m.	3.10 p.m.	11.35 a m. (29th)
Wednesday, August 29	Welshpool	2 p m	12 59 p m	12 59 p.m. (30th)
Thursday, August 30	Foster	2.1 p.m.	2 1 p.m.	2.21 p.m.
Friday August 31	Stony Creek	Noon	11 40 a m	3.19 p m
No 29				
Tuesday, August 28	Mernda	11 a m	9 50 a m	1 36 p m
Tuesday, August 28	Whittlesea	2.30 p.m	2 p.m.	7 55 p.m
Wednesday, August 29	Lilydale	2 p.m	1.53 p.m	5 25 p.m
Thursday, August 30	Ballarat	11 30 a m	11 8 a m	3 p m
Friday, August 31	Romsey	11 a m	10.40 a.m	Driving
No 30				
Monday, September 3	Dromana	1 30 p m.	1 p m	2.20 p.m
Tuesday, September 4	Cowes	1 p.m.		
Wednesday, Sept. 5	Stony Point	11 a.m.	11 a.m.	11.30 a.m
Wednesday, Sept. 5	Frankston	2 p m.	12.26 p m	5 52 p m
No 31				
Tuesday, September 4	Orbost	10 a.m	7 15 p m (3rd)	8.50 a.m. (5th)
Wednesday, Sept. 5	Nowa Nowa	10.30 a.m.	10.14 a.m.	Driving
Wednesday, Sept. 5	Buchan	Noon	Driving	Driving
Thursday, September 6	Bairnsdale	Noon	11.20 a.m	Driving
Thursday, September 6	Lindenow	3.4 p.m	Driving	3 p.m
No 32				
Tuesday, September 4	Omeo	3 p.m.	3 p.m.	5.30 a.m. (5th)
Wednesday, September 5	Bruthen	3 p.m.	11.45 a.m	9.45 a.m. (6th)
No 33.				
Wednesday, September 19	Sunbury	11 a.m.	7.41 a.m.	3.6 p m
	French Island			
No 34				
Wednesday, September 19	Royal Show	1.30 p.m.		
Thursday, September 20	Royal Show	9 a.m.		

CITRUS FRUIT EXPORT.

Results of Experimental Shipments.

By S. A. Cock, Citriculturist, Department of Agriculture

Can Australia Compete with South Africa?

For the purpose of exporting to oversea markets the citrus-growers of this State early in 1922 combined into district associations, and with the Murray border districts of New South Wales grouped up under an organization called the "Victorian Central Citrus Association." The Murrumbidgee areas of Griffith and Leeton in New South Wales also shipped through this central association, their oranges being placed on ship at Sydney.

This oversea export marks a distinct advance in the citrus industry, and the following extract from the *Age* of the 19th February, 1923, gives an idea of what is thought of Victorian oranges by our rivals:—

Australian Oranges.

SOUTH AFRICA ADMITS THEIR SUPERIORITY.

> Australian oranges reach Great Britain in the English summer. Their most formidable competitor is the orange from South Africa. Proof of the statement made that Australian oranges are superior to those from South Africa is contained in a report by Mr. Canahan, the South African Trade Commissioner. He states:—The arrival in fairly large quantities of Australian oranges has not unnaturally created a standard of comparison, and it is not pleasant to be told on almost every hand that South African oranges are inferior in quality, in appearance, and even in packing to those from the sister Dominions. But I am afraid that we must admit that fact. Higher prices are undoubtedly being obtained for Australian fruit. Our shippers enjoy substantial advantages both as regards rates of freight and longer experience of the trade, and it should not be difficult to place on the market fruit from the Union which will be equal to, if not excel anything that may be brought into competition with it. It means constant supervision, as well as the elimination of everything calculated to lower our reputation. The success of a pack in the main is made in the packing house. This responsibility cannot be placed on the inspector at the port, valuable as this work undoubtedly is, and unless the packer himself takes a pride in his business, and ships only the best stuffs, we cannot expect the highest results. This is cheering information when the packing of many Australian products exported overseas is so frequently criticised as faulty."

Where Our Citrus Industry can be Improved.

Of course, this comment is very gratifying, but at the same time it conveys to us a useful message. And the message is: That South Africa is not going to remain idle, but will immediately seek to remedy the defects that have been made so apparent in their citrus industry. The shipment, which aroused the admiration of the South African Trade Commissioner, was Victoria's initial effort in citrus export, and we, consequently, have all the more reason to congratulate ourselves. We must not, however, be carried away by any compliments paid us. There are many defects to remedy, difficulties to overcome, and as far as South Africa is concerned, keener competition to combat. Growers should, therefore, give earnest and serious consideration to the following important phases in citrus culture.

1. ELIMINATION OF UNSUITABLE VARIETIES and working over with varieties proved for quality, both of rind and pulp. This applies more particularly to the Navel orange, and the elimination of the Navalencia and Thompson's Improved is strongly urged, on account of the variability of their citric qualities, which through the differences of soil and climatic conditions render these varieties too uncertain as a commercial proposition. Unfortunately in the past many of these trees were sold as Washington Navels, and growers have now to face the arduous task of overworking these, and also other off-type Navels (the result of indiscriminate bud selection by nurserymen) with buds from trees which have proved themselves, and are producing the correct type of Washington Navels.

2. GROWERS HAVE ALSO TO RECOGNISE THAT LARGE FRUIT IS NOT REQUIRED EITHER FOR LOCAL OR EXPORT MARKET. This brings under consideration the question of intelligent cultivation, manuring and irrigation, all of which, separately and conjointly, are of the utmost importance in relation to the quality of the rind and pulp of the orange. The free use of nitrogenous manures, whilst stimulating the growth of the trees, is inclined to produce large rough fruit. Potash and phosphate manures, on the other hand, are required to improve the quality of the rind and pulp of the fruit. What the grower requires to consider is that citrus culture is an individual tree proposition. He should, therefore, strive to find out the trees' requirements, and endeavour to adjust the balance between steady growth and quality fruit. Again, light sandy soils, sandy loams, and heavy soils produce different quality fruits, even in similar varieties; hence the study of the food requirements of the tree is of the utmost importance.

BY THE GROUPING OF THE GROWERS INTO ASSOCIATIONS MUCH GOOD SHOULD RESULT. It has been suggested to each association that it should study the conditions which obtain in each district, and by experiment and comparison strive to overcome cultural difficulties. Our fruit has won a good name overseas, and we must endeavour to heighten that reputation, not only as regards quality, but also as regards standard. To that end it is proposed to establish packing sheds in every district grouped as an association. These sheds will be adjacent to the railway, and will be thoroughly equipped for the purposes of grading and packing. It would also be of a great advantage if a standardized grading machine were used in every shed. In almost every district where a standardized grader was used with this season's crop, most of the fruit sent overseas arrived in good condition, while in the fruit from places where various types of grades were used or hard-grading resorted to, much loss was reported. The following statement of the various shipments with the reports forwarded by the Agent-General for Victoria will indicate to the districts the importance of correct grading:

DISTRICTS FORWARDING ORANGES AND INSURANCE ADJUSTMENTS.

District	Number of Cases	Insurance Adjustments.			
		Number of Cases Paid on	Average Amount Paid per Case		Percentage on District Consignment.
			s.	*d.*	
Mildura	374	181	5	3	48
Irymple	2,501	1,488	6	10	60
Merbein	3,564	1,502	6	0	42
Curlwaa	2,127	1,123	4	3	53
Nyah	1,304	523	3	1	40
Riverside	463	81	4	2	17
Tresco	1,980	902	3	6	46
Swan Hill	167	64	3	7	38
Picola	187	85	4	7	45
Cobram	1,010	752	6	3	74
Shepparton	617	109	4	7	18
Bamawm	918	163	2	4	18
Echuca	292	100	4	0	34
Kyabram	650	242	2	9	37
Perricoota ..	214	106	1	9	49
Griffith, N.S.W.	1,959	877	6	0	45
Dennys, Lascelles	380	156	2	9	41
Total	18,707	8,454	5	1	45

Wastage in Fruit Exported.

The average amount paid per case is given for the purpose of indicating the amount of wastage shown in the consignments, and is based on the net amount received by the growers. The percentage averages on the district consignment indicate the number of cases containing wasty fruit, and is no indication of the total average waste of the consignment. This can be arrived at only by a knowledge of the fact, whether growers had to bear the first 10 per cent. of waste, or whether payment was made on the total waste. Apparently, as far as can be judged, the payment is on the total wastage. Taking the sum received for the full shipment by the Victorian Central Citrus Association, excluding Dennys, Lascelles, but including Griffith, New South Wales, at £14,900 gross, London, and taking the amount of the insurance at £2,300 gross, it would indicate that the amount of wasty fruit was approximately 13½ per cent. for the total consignment. The amount of insurance paid by the Central Association amounts to approximately 2s. 4d. per case, and represents a sum of £2,000, so that shippers will be well advised in future to pay proper attention to the quality of the fruit forwarded to make sure of proper grading and packing, and to insure only against total loss or breakdown of the refrigerating machine, or what is known as F.B.A. insurance.

The amount realized for a shipment by Dennys, Lascelles per the *Demosthenes* has not been supplied; consequently the figures given in the case of this firm are for shipments forwarded by the *Barrabool* and *Beltana* only.

SUMMARY.

Shipment	Number of Consignors.	Number of Cases.	Credits, as per Account Sale.	Debits, as per Account Sales.	Percentage of Debits against Debits and Credits	Insurance Claims.							
						Number of Consignors claiming.	Number of Cases paid on.	Amount paid (net).			Average Amount per Case.		Percentage on Total Shipment
								£	s.	d.	s	d	
Moreton Bay .. .. Sailed, 14 6 22, started to discharge London, 25.7 22	137	3,451	134	3	2	30	160	110	15	7	13	10	4½
Ascanius Sailed, 1 7 22, London 24 8 22	168	3,617	141	27	16	162	2,267	625	10	6	5	6	62
Kent Sailed, Sydney, 5 7 22; London, 1 9 22	35	752	8	27	77	31	402	127	15	3	6	4	53
Barrabool .. Sailed, 7 7.22, London 28 8 22	141	2 808	84	57	40	116	1,351	136	0	8	6	[illegible]	48
Beltana Sailed 24 7 22, London, 20 9 22	169	1 179	49	120	71	163	2,815	473	18	1	3	4	63
Demosthenes . Sailed, 3 8 22, London 16 9 22 (excluding Dennys Lascelles)	159	3,570	28	131	82	146	1 459	390	7	4	[illegible]	4	41
	809	18,707	444	365	41	648	8,454	2 164	16	5	5	1	45

Lessons from the Experiment.

By taking the debits in the above summary and placing them against the total debits and credits it might seem that there is a steady increase in the deterioration as the season advances. This may be so, as the fruit from early districts was fully ripe, as compared with that from the later ones, and the summary shows that the later districts have had less wastage than the earlier.

Again, there is no evidence as to the best route for our fruit, as only one boat, the *Moreton Bay*, went *viâ* Suez, all the later boats going *viâ* the Cape. With such insufficient data it is scarcely fair to make comparisons. After the *Moreton Bay*, three shipments were made in the experimental chambers of the Commonwealth Line. The loss on only two of the shipments can be given, no figures for the *Hobson's Bay* shipment having come to hand. The loss on account of wastage on the fruit sent by the *Esperance Bay* and *Largs Bay* was 10 and 33 per cent. respectively.

The thirty-three cases mentioned as lost in repacking citrus shipped on the *Largs Bay* may not all have taken place on the voyage. The fruit was for the Crystal Palace Show, and was removed to cool storage, and afterwards repacked for the show. Unfortunately, it is only in a comparison of the figures supplied and a perusal of the reports forwarded by the Agent-General that the faults of the shipment can be sought for. A reference to the average charges and percentages under the insurance claims show that the shipments varied in their wastage. Considering this fact with the debits and credits, and taking the difference as shown in averages and percentages for wastage, the want is revealed of a clear statement from London showing on what average the insurance is paid. This would give a better idea of the actual wastage. It is suggested, therefore, that these matters be more clearly defined in future shipments.

In addition, allowance has to be made for the fact that there is no check on the carriage of the fruit under refrigeration, such as the number of times the chambers were opened to receive more cargo, the absence of long-distance thermometers, and also self-registering thermometers in the chamber itself. Therefore, the statement of the engineer has to be accepted. In future consignments it is hoped these defects in the carriage of oversea refrigerated cargo will be removed.

The districts, however, will, I feel sure, read into this article the defects that are their own. Old districts, such as Irymple, Merbein, Curlwaa, and Cobram must realize that they have suffered by comparison with the younger districts of the State, and they must realize that to be successful, standard-grading machines, properly equipped packing sheds, and care and attention in cultural methods, and also in picking and handling, are necessary factors for successful export.

Taking everything into consideration, and realizing the fact that this was the initial effort of Victoria in citrus export, there is no reason to be ashamed. The watchword of the citrus-grower should be, "Combine, co-operate, organize, standardize, utilize knowledge, improve production and presentation." The sum of 18s. 6d. per case charges this season does not leave much margin for the shipper, but it is hoped that next season 12s. 6d. per case will cover all charges This should result in a reasonable return for all oranges exported.

EXPERIMENTAL SHIPMENTS.

Shipments	Districts contributing	Number of Cases	Remarks.
Largs Bay .. Sailed, 9.8.22; London, 28.9.22	Mildura .. Irymple Curlwaa Riverside Tresco Swan Hill Shepparton Bamawm Perricoota Griffith, N.S.W.	95	33 cases lost in repacking. 38 cases sold at 27s. 6d. per case. Insurance recovery, 4 cases at 16s. 9d. each. 24 cases for Crystal Palace Show. Result of Exhibit.—2nd prize, silver medal and £10 cash to Griffith, N.S.W.; 3rd prize, bronze medal and £5 cash to V.C.C.A., made up of six cases from the following districts:—Merbein, Curlwaa, Swan Hill, Bamawm, and Shepparton; 1st prize, gold medal and £20 cash was won by E. G. Wood. Riverside, who shipped through Dennys, Lascelles
Hobson's Bay .. Sailed, 6.9.22	Tresco ..	85	Realized in London £102 18s.
Esperance Bay .. Sailed, 6.10.22; London. 13.11.22	Irymple .. Kyabram .. Perricoota .. Griffith, N.S.W.	90	Valencia Late.—Realized from 35s. to 45s. per case. Loss in repacking 7½ cases, ; returned £154 19s.
	Bamawm .. Tresco .. Madowla ..	56	Washington Navel.—Realized from 40s. to 50s. per case. Loss in repacking 7¼ cases, ; returned £114 1s. 3d.

Another experimental shipment was forwarded on the *Hobson's Bay.* This is referred to in the report of the Agent-General.

The absence of detailed statements regarding these experimental shipments is not satisfactory, and in future it is proposed that full details should be supplied for the guidance of shippers. The value of experiments cannot be over-estimated, not only as to carrying quality of the fruit, but also for the purpose of proving markets. Apparently there is a market for Valencia Late and Navels in October and November. This is the time when supplies are short from South Africa, and the Mediterranean fruit has not been placed on the market. Shippers, however, will be well advised to again prove these months before shipping in large quantities. If it can be proved a large market exists at this time, there is no doubt that we can supply it with Navels from the heavy soils and late districts, and with Valencias from both early and late districts. Contemporary with these overseas shipments experiments have been carried out in cool storage at the Government Cool Stores under the supervision of Mr. D. B. Adam, B. Ag. Sc., cool storage experimentalist. The results of his investigation, which are of the greatest importance to citrus-growers, are printed on pages 307-317.

REPORTS ON SHIPMENTS BY THE AGENT-GENERAL, THE HON. JOHN McWHAE.

Shipment per s.s. "Moreton Bay."

London, 27th July, 1922.

This vessel started to discharge on 25th inst. The temperatures at which the Victorian fruit was carried are as follows:—

Melbourne to Adelaide, 43° Fahr.
Melbourne to Fremantle, 41° Fahr.
Melbourne to Colombo, 40° Fahr.
Melbourne to Port Said, 40° Fahr.

And within four days of arriving in London the temperature was raised from 40° to 55° Fahr. The oranges arrived in excellent condition, and Mr. F. White, of the Agent-General's Department, states: "On inspecting the hold, I found that great care had been taken in the storage of the fruit. The space between each layer of boxes was 2 inches and over, which enabled the air to circulate freely. In discharging, several boxes were broken in halves. This could be prevented by a wire band at each end, similar to South African boxes."

EXPERIMENTAL SHIPMENT.

Carried at a temperature of 38° to 42° Fahr. in experimental chamber, average 40°.

Tresco.—Twenty-eight cases of Washington Navels. Half in hardwood cases and half in softwood cases. Half of consignment sweated and half not sweated. No difference noticed either as regards cases or sweated and non-sweated fruit. Prices realized—

1 case, 70's, at 20s.
16 cases, 96's, at 20s.
10 cases, 126's, at 21s.
1 case, 150's, at 22s. 6d.

Curlwaa.—Ten cases Thompson's Improved in softwood cases. Prices realized—

4 cases, 64's, at 20s.
4 cases, 80's, at 20s.
4 cases, 112's, at 21s.

Merbein.—Four cases Washington Navels in softwood cases, vaselined after sweating. Prices realized—

1 case, 80's, at 20s.
1 case, 96's, at 21s.
2 cases, 150's, at 21s

Fifteen cases Jaffas in softwood cases. Prices realized—

1 case at 24s.
1 case at 23s.
3 cases at 22s.
1 case at 21s.
7 cases at 20s.

Two cases to ship's officers.

Ten cases of mandarins in softwood cases. Half Beauty of Glen Retreat and half Emperor mandarins. Prices realized—

2 cases at 27s. 6d. 3 cases at 40s.	Beauty of Glen Retreat.
4 cases at 25s. 1 case at 24s.	Emperor.

No reason given as to difference in price obtained for these varieties.

Irymple.—Eleven cases of Navelencia oranges in softwood cases carried in general shipment of oranges. Prices realized—

4 cases, 96's, at 20s.
1 case, 96's, at 20s.
4 cases, 112's, at 20s.
2 cases, 176's, at 22s.

Further Report on the Victorian Oranges ex s.s, "Moreton Bay."

Boxes.—These were very nice, clean and of good size and attractive appearance. I almost think that the box was too good, as it looks as if it cost quite a considerable amount. The box that the South African trade is using could, at the present time, be delivered c.i.f. Melbourne for 1s. 2d. It is a good box, and will be quite suitable for the Australian trade. It does not affect the price of the oranges whether packed in hardwood or softwood cases with iron hoops at each end. I would suggest that the cheapest should be used, so as to reduce the price of the case.

The branding of the box was liked; some buyers suggested that the name of the grower should be on.

Packing.—This was distinctly good, except for one district, the "Irymple." I noticed very little fruit was damaged in the picking, but some cases were not full enough, the buyers liking to see, when a case is open, very little space left between the lid and the fruit.

Quality.—This was generally good. Some of the larger oranges were on the coarse side, and the run of the fruit was too large. The popular sizes here are from 176 to 250 oranges to the case, and sizes such as 64, 80, 96, and 112 oranges to the case are difficult to sell, and make less money.

Wrapping Paper.—Many of the oranges were not completely wrapped, the paper being too small to contain the fruit. If no larger size is available two pieces should be used. The trade is not generally in favour of the grease-proof paper. It was tried in South Africa and also in Spain, and both these countries dropped it some years ago. The market is still experimenting, but as far as can be ascertained, they have not succeeded in producing a grease-proof paper that carried fruit as well as a porous paper. The trade experience in importing fruit has been that the paper should be absorbent. Grease-proof paper does not allow the fruit to evaporate; in fact, it causes the evaporation to settle on the paper and the fruit in the form of moisture, which naturally must have a harmful effect on any fruit which is being carried under refrigeration.

Many customers complain that the grease-proof paper holds the dust, thereby making the fruit look stale when on sale in shops.

The market and also the shopkeepers prefer the paper branded, as they consider it gives the fruit a more attractive appearance.

The design of the kangaroo at present used on the paper wrappers is quite good. I would suggest that if the whole of the design was of a purple colour, it would show up better against the golden colour of the fruit.

Condition of Fruit.—With the exception of one district (Irymple) the condition was good. The fruit from Irymple was rather poor, not graded well, and contained too many oranges bearing tree marks. The fruit grown under irrigation naturally will not stand very long, and there was a distinct change noticeable in a week after the fruit came out of cold store. The market considers that the shipment from the Merbein district was in the correct condition. The boat shipment generally appeared to be on the ripe side. With regard to the fruit carried in the experimental chamber, there was very little difference between this and the bulk of the shipment, except that it was somewhat firmer.

Prices.—These were naturally not high, due to the following reasons:—

1. The oranges generally were too large.
2. Over 13,000 South African oranges arrived the same week, and the bulk of same were small fruit
3. The boat arrived just before August Bank Holiday, which meant that unless the fruit was sold within the week, it would have to be held over the holidays and brought into a dead week. No fruit of this description is wanted between the Wednesday before a holiday and a week after.
4. Big crops of English plums, apples, French William pears, and greengages being on the market.

Victorian oranges are fetching the following prices:—

200 to 252 oranges to the case, 24s. to 25s. per case.
126 to 176 oranges to the case, 22s. to 23s. per case.
96 to 112 oranges to the case, 20s. per case.
68 to 80 oranges to the case, 18s. to 20s. per case.

Mandarins.—We do not recommend exporting these except in very small quantities, this being a fruit that can only sell in the winter months when there are no soft fruits against it. The few cases of Victorian mandarins consigned fetched from 25s. to 30s. per case, one or two cases 40s. per case, which is quite an exceptional price, and might not be obtained if larger quantities were consigned.

Shipment per s.s. "Ascanius."

London, 5th September, 1922.

This vessel started to discharge her oranges on 24th August. The fruit was carried at a temperature of 36 deg. to 44 deg. Fahr., average 40 deg. The engineer started to raise the temperature within six days from Hull. Between each layer of boxes was 1 inch of wood, and in the centre was 3 inches to allow of good ventilation.

The condition of the fruit by this boat was fair only, quite a number of cases marked B.B. (Merbein) and B.C. (Irymple) contained five or six bad oranges—practically pulp. This may have been caused by the packers overlooking bruised fruit, or placing wet fruit in the grease-proof paper, which does not allow evaporation. The best marks were B.H. (Tresco), B.F. (Nyah), B.E. (Riverside); B.B. and B.C. were the worst. The remarks made in my report on oranges *ex* s.s. *Barrabool* with regard to grading, packing, and paper shavings used apply also to this shipment. The prices realized on landing—25th August—were 20s. to 22s., with a tendency downward. Prices realized on 5th September 16s. to 18s. Market weak.

London is considered the best market for oranges, and the men on the market consider that the proportion between the three ports should be as follows:—

London, 60 per cent.
Liverpool, 25 per cent.
Hull, 15 per cent.

I mention this, as next season too large a quantity may be consigned to Hull as the result of the good prices realized for the South Australian oranges *ex* s.s. *Ascanius* at that port. The market here consider that the Washington Navel oranges coming from Victoria are superior to those coming from South Africa, and they have nothing to fear from them, and can stand on their own merits on this market.

Further Report on Shipment of Oranges per s.s. "Ascanius."

As previously reported the fruit on the above boat arrived only in a fairly satisfactory condition. The following information is supplied for guidance of shippers:—

B.A. (Mildura).—Fruit nicely graded and well coloured, but skins a little too coarse in some cases.

B.B. (Merbein).—Practically the same remarks apply as for B.A.

B.C. (Irymple).—Badly graded fruit; coarse skins and black eye (Botrytis); a good deal of waste. This mark has been the worst on each boat.

B.D. (Curlwaa)
B.E. (Riverside) } Fruit of fair quality, but showing waste.
B.F. (Nyah)

B.H. (Tresco).—Fruit of good quality; well graded. The best mark of the shipment.

B.O. (Cobram).—Fruit nicely coloured, but very light in weight; skins rather thick; grading poor.

Shipment per s.s. "Barrabool."

London, 7th September, 1922.

The above vessel started to discharge on 28th August, and the cases I saw opened were in good condition. The temperature at which the fruit was carried was from 37 deg. to 41 deg. Fahr. Between each layer of boxes there was 1 inch of wood and in the centre of the pack 3 inches to allow of good ventilation. There were a number of cases broken in handling, and as suggested previously, a wire band at each end of the case would save these breakages.

Badly graded fruit.—B.B. (Merbein) 1,101 contained 96 oranges to the case, and would have taken 112 if properly packed and graded. The same applies to B.B. 1,100. In fact, in many cases more oranges could have been packed to the case with proper grading.

B.J. 1,681 (Bamawm).—One hundred and twenty-six oranges to the case. This case was graded and packed correctly, and had five layers of fruit, which gave the appearance of a good full case when opened.

Lisbon lemons marked B.E. (Riverside).—A large number of these were badly marked, and nearly all had moisture showing on them, owing to the grease-proof paper, which does not allow of evaporation. The fruit will not pay to send here, as there are plenty of Continental lemons on the market. Messina lemons, 300 to the box, selling at 6s. to 12s.; Murcia lemons, 300 to the box, at 10s. to 14s.; Navies, 300 to the box, 8s. to 12s. according to quality.

There is no use in using paper shavings, as they are of no benefit to the oranges, and make the case unsightly with the strips of paper coming through the sides of the case. The hardwood cases are a success, being much stronger than the softwood, and I have no doubt would be cheaper, and the hardwood case makes no difference to the selling price of the oranges.

Prices realized on 29th August, 20s. to 22s. Prices realized on 5th September, 16s. to 20s. Market weak.

Shipment per s.s. "Beltana."

London, 3rd October, 1922.

This vessel started to discharge her oranges on the 20th September at King George V. Dock. The temperature at which the fruit was carried was 38 deg. to 40 deg. Fahr. The stowage of the fruit had 1 inch battens between each layer and between each layer 3 x 3-inch battens. The general turnout was fair; a large number of cases contained fruit showing dry waste and blue mould.

Messrs. G. Monro forwarded 3,000 cases to Hull and 1,500 cases to Liverpool owing to s.s. *Beltana* and *Demosthenes* coming in together.

also 15,000 cases arriving from the Cape the same week. Liverpool reports say they consider the dry waste and blue mould is caused by insufficient air to the oranges. I would, therefore, suggest that a consignment be sent with the battens on the cases 1 inch apart, and that absorbent tissue paper be used for wrapping the oranges, and no shavings or packing of any kind used.

Cases marked B.O. (Cobram), B.B. (Merbein), B.E. (Riverside), B.C. (Irymple) had from ten to twelve bad oranges to the case, and some forty to fifty bad oranges; a few had only ten to twelve sound oranges.

Prices realized at Hull and Liverpool, 13s. 6d. to 20s., and at London, 14s. to 18s.

Shipment per s.s. "Demosthenes."

London, 3rd October, 1922.

The above boat started to discharge her oranges at King George V. Dock on 16th September. The temperature at which the fruit was carried was 38 deg. to 42 deg. Fahr. Three-eights of an inch battens were used between each layer of boxes in the hold. There were a number of broken cases, and, as suggested before, wire bands would prevent this. Cases marked B.O. (Cobram) were discharged in a pulp condition, the juice running from the cases in the sheds at the dock. The fruit arrived in wasty condition, and the following cases were condemned by the sanitary authorities:—

B.O. (Cobram), twenty-nine cases.
B.H. (Tresco), four cases.
B.M. (Shepparton), one case.
B.K. (Kyabram), one case.

Cases marked B.C. (Irymple) were very poor indeed, and showed signs of going bad at the start. B.D. (Curlwaa) were wasty, and fetched in some cases 5s. per case.

B.M. (Shepparton), and B.P. (Perricoota).—Good fruit; bad condition.

B.O. (Cobram).—Fruit good colour; bad weight; coarse skin and wasty on arrival.

B.E. (Riverside)
B.Q. (Echuca)
B.D. (Curlwaa)
B.F. (Nyah)
Fruit good colour; good quality; also slightly wasty on arrival.

The unreliability of condition manifested itself very rapidly throughout the boat, making it increasingly difficult to cultivate the trade in its favour as a fancy fruit. Prices realized 14s. to 18s. A number of cases lost in repacking.

Further Report on Shipment per s.s. "Demosthenes."

Messrs. Geo. Monro Ltd. informs me that this is the worst lot of oranges we have received. Not only was the fruit very bad, but the cases were wet and badly stained. This fact alone is enough to cause a bad impression amongst the trade, and combined with the large amount of waste make it difficult to dispose of the fruit at any price.

B.C. (Irymple).—Badly graded and packed, black eyes (Botrytis) was very prevalent, and considerable waste showing.

B.M. (Shepparton).—This fruit was well packed and nicely graded, but unfortunately a wasty condition prevented satisfactory prices being obtained.

B.P. (Perricoota).—There was very little to choose between this mark and B.M.

B.H. (Tresco).—This fruit appears to have been very good when picked, but arrived showing 50 per cent. of waste.

B.O. (Cobram).—Very wasty indeed; the worst mark on the boat No. 1845 was particularly bad, no less than twenty-six cases being condemned by the food authorities.

B.K. (Kyabram).—Nice fruit of good colour, but wasty.

C mark (New South Wales).—Fruit of good quality, but showing nearly 50 per cent. waste.

C 2048 (New South Wales).—Two cases of grape fruit. These were very common fruit, of bad colour and very light weight. The fruit does not compare at all favorably with the Jamaica grape fruit, and further shipments are not recommended.

Agent-General's Comments on Insurance Charges.

London, 14th November, 1922.

With reference to the insurance charge of 2s., this large amount is caused by insuring against deterioration of the oranges on the boat. This lends itself to fraud, as there have been instances where bad fruit has been shipped, which it would have been useless to ship if Lloyd's insurance had not covered for this, and at the same time it is unfair to those growers who are consigning good fruit to the market. This item of 2s. could be reduced to 2d. if there was no insurance against deterioration, and I would, therefore, suggest that it be done away with; while there should also be every endeavour made to get a reduction of 2s. per standard case of oranges, making it 5s. 6d. so as to enable growers to establish a market here on a profitable basis

Shipment on s.s. "Largs Bay."

London, 3rd October, 1922.

Started to discharge on 18th September. Carried at a temperature of 37 deg. to 40 deg. Fahr. 1½-inch battens between each layer of cases, with a fan working in a special chamber. This fruit was shipped in the experimental chamber, and after discharging from ship was placed in cool storage prior to opening of *Daily Mail* Show. There were some very fine Washington Navel oranges amongst this consignment. They were of medium size, 176 to the case, clean and sound This is the class of orange required on this market. If consignments similar to these were consigned they would be worth to-day from 25s. to 30s. per case on a bad market.

(The prizes awarded the fruit are given in the remarks on shipments. The Agent-General had the boxes of prize fruit displayed, together with the medals awarded in *The Strand.* He also forwarded a case from the first prize lot to the Queen. He states: "This is the best way to reply to the astounding statement made by one of the members of the Board of Trade, who is on the executive committee of the British Empire Exhibition, that South African oranges were the only ones fit to consume in the Exhibition.")

The Agent-General further states:—"The oranges grown by E. G. Wood, of Riverside, Victoria, are the kind of Washington Navel oranges required on this market, and if consignments are sent similar to these they will command the highest price. The best selling prices are from 150 to 200. Small sizes carry the best. The best packing material is wood wool, but no packing material is necessary in the case of oranges. Messrs. Geo. Monro Ltd. considers that grease-proof paper is injurious to all fruit, and strongly recommends that its use be discontinued; they mentioned that one consignment of 200 cases arrived this season packed in non-grease-proof paper, and there was not a bad orange in the lot."

Shipment on s.s. "Hobson's Bay."

London, 1st November, 1922.

Temperatures at which oranges on the above boat were carried are as follows:—Chamber temperature on receiving fruit at Melbourne, 46 deg. Fahr., and was reduced to 40 deg. and 41 deg. Fahr. for remainder of voyage until passing Gibraltar, when the temperature was allowed to rise gradually to atmospheric temperatures. Some of the oranges were wasty, but owing to a shortage on the market they made very good prices, viz., 26s. to 30s. per case.

Shipment on s.s. "Esperance Bay."

London, 15th November, 1922.

This vessel started to discharge her oranges on 13th inst. The chief engineer informed me that he carried them at a temperature of 38 deg. to 42 deg. Fahr. Some of the oranges were good, others wasty. The Valencias averaged thirty wasty to the case containing 250. Case marked B.C. 1197 (Newton Brothers, Irymple) contained some very fine Valencias, the colour being first class.

B.J. (Bamawm), 1,690; half bad.
B.J. (Bamawm), 1,611; 25 per cent. bad.
B.J. (Bamawm), 1,609; 33 per cent. bad.
B.J. (Bamawm), 1,591; 15 per cent. bad.
B.J. (Bamawm), 1,638;; 20 per cent. bad.

All bad and wasty fruits were repacked. The market being very short of this fruit, they are realizing for Navels 40s. to 45s., and Valencias 35s. to 40s. per case.

South African Oranges Sold in London.

The following figures relating to the quantities of oranges shipped from South Africa to England and the prices obtained for same during portion of last year have been supplied by the Agent-General:—

Week ending—		No. of Cases.	Price per Case.
			s. d. s. d.
June	10	762	30 0 to 35 0
	17	1,415	25 0 to 30 0
	24	6,445	25 0
July	1	9,480	16 0 to 18 0
	8	5,113	18 0 to 20 0
	15	22,000	18 0 to 20 0
	22	23,911	18 0 to 20 0
	29	28,488	20 0 to 22 6
August	6	7,445	22 0 to 24 0
	12	34,493	22 0 to 24 0
	19	17,768	24 0 to 25 0
	26	21,211	18 0 to 26 0
September	2	16,632	18 0 to 24 0
	9	8,644	16 0 to 18 0
	16	17,193	14 0 to 18 0
	23	18,848	16 0 to 18 0
	30	10,023	16 0 to 18 0
October	7	8,850	18 0 to 20 0
	14	2,948	20 0 to 22 0
	21	14,030	23 0 to 26 0
Total		275,699	

* * *

EXPERIMENTS IN CITRUS FRUIT STORAGE.

D. B. Adam, B. Agr. Sc., Department of Agriculture.

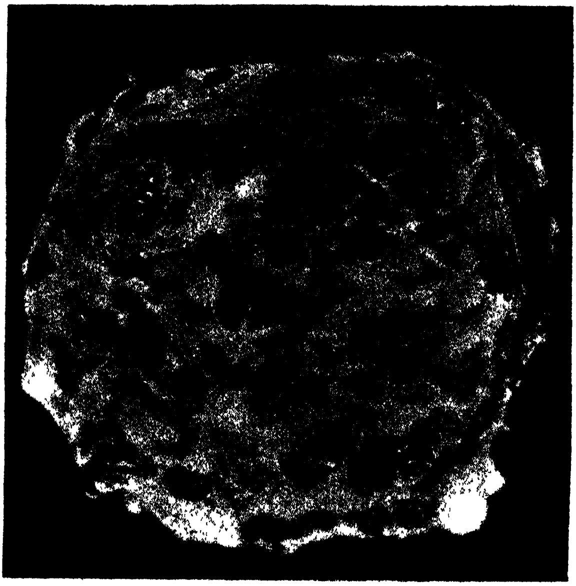
These experiments have been conducted rather on the lines of the hard fruit experiments, where a determination of the losses under different conditions of storage was made, than as an experiment to demonstrate the economic possibilities of cool storage. In this latter instance, the life in store is determined more by the condition and prospects of the market than the actual condition of the fruit. A study of the factors limiting the "storage life" of citrus fruits involves, however, quite different problems from those considered under the headings of apple and pear storage. Losses in citrus fruit which may be ascribed to physiological causes are small, practically the whole loss with these varieties of fruit is due to fungus attack, particularly from the so-called "mould fungi."

Thus conditions affecting the growth of moulds generally determine the cool "storage life" of citrus fruits.

ORANGE STORAGE.

Washington Navel oranges grown at Ballendella, Tongala, Tresco, Riverside, and Late Valencias grown at Barham, have been stored under experimental conditions. This has enabled tests as to the effects of storage at different temperatures, the use of different kinds of wrapping papers, and "sweating" on the keeping qualities of oranges, to be performed. The keeping qualities of fruit from the different districts packed in both hard and soft wood cases can also be compared.

The following species of fungi were isolated from oranges in cool store:—*Penicillium digitatum* (*Fr.*) Sacc.; *Penicillium italicum* Wehmer; *Botrytis cinerea*, Pers.; *Sclerotinia libertiana*, Fekl.: *Alternaria citri*, Ellis and Pierce; *Pythiacystis citriopthora* Sm. and Sm., *Dematiam pullulans* De Bary; *Cladosporium sp.* Generally, *P. digitatum*, the olive-green mould, is the cause of most of the wastage in orange storage. In some particular instances *Botrytis cinerea*, the grey mould, caused the greatest amount of loss. *Botrytis* infection frequently commences around the stalk button which is left on the fruit; hence the name "Black eye" is given to oranges so affected. Areas affected by *Botrytis* become soft, affording a good stratum for other fungi to develop. In such areas *P. italicum* occurred much more frequently than did *P. digitatum*. The amount of loss from fungi other than from these three mentioned was small and localized. The presence of the diseases Brown Rot, due to the fungus *Pythiacystis citriopthora*, and the Cottony Mould, due to *Sclerotinia libertiana*, should be noted. The possible serious consequences of these diseases in storage problems, as shown by experience elsewhere, demand that they should receive attention in the grove, where, according to the best known methods of control, it is necessary to practise prevention methods.



Orange affected by the Cottony Mould, *Sclerotinia libertiana* after some period in cool store.

The Experimental Results.

(1) THE EFFECT OF TEMPERATURE OF STORAGE ON MOULD DEVELOPMENT.

Fruit has been stored at 32° F., 34° F., 37° F., and 39°-40° F. The figures given below give the percentage affected at the different temperatures irrespective of the extent of its development on individual fruits. The numbers of oranges examined in each consignment, at each temperature, vary from 70 to over 300.

Only oranges that were treated as uniformly as possible in other respects, being neither wrapped nor "sweated," were compared. The results are given in Table 1.

TABLE 1.

District	Variety	Storage Period, in Days	Temperature Per Cent Mould at—			
			32° F	34° F.	37° F	39–40° F
Riverside .	(*a*) Washington Navel	96	1	8·1	No figures	12·3
,,	(*b*) ,,	90	No figures	6·6	5·1	10·3
Tresco .	,,	94	7·1	7·6	24·6	26·2
Tongala .	,,	108	11·2	No figures	47·3	47·9
Barham ..	Late Valencia	106	0·7	1·6	5·0	5·4
Average..	.		5·0	10·6	20·2	20·5

Figures for wrapped and " sweated " fruit showed the same comparative wastage at different temperatures, though the variations were much smaller. The incompleteness of series treated uniformly in other respects, however, precludes their presentation as experimental evidence. The results clearly illustrate the benefits of low temperatures in orange storage. The difference in waste in fruit stored between 40° F. and 37° F. and between 37° F. and 34° F. is worthy of particular notice Apparently, the inhibition of mould growth for each degree below 37° F. is much greater than is the increase in development for each degree above 37° F.; 37° F. is a critical temperature for these mould fungi. Nothing has been said of the composition of the mould flora. This varied; *Botrytis cinerea*, the grey mould, affected over 60% of the wasty oranges in the Tongala consignment. In the other consignments *P. digitatum* was the fungus present on the majority of wasty fruits. The percentage mould appears to decrease approximately uniformly with temperature, irrespective of the actual causal agent. 32° F. gives the most satisfactory results from a purely freedom from mould standpoint. At 32° F., however, under certain conditions " spotting" and " blotching" may occur. This objection to storage at 32° F. is discussed later under the heading of " spotting " on oranges.

In view of this consideration and the difficulty of maintenance of precise temperature in practical cool storage management a temperature of 34° F. is recommended.

(2) THE USE OF DIFFERENT KINDS OF WRAPPING PAPERS.

Oranges grown and stored under different conditions have been tested as to their keeping qualities when wrapped with waxed papers similar to those used in last year's shipments overseas, with the ordinary sulphite tissue papers, and when not wrapped.

Table II. gives a comparison of the results of the use of these papers with Washington Navel oranges from Tresco stored at two different temperatures.

TABLE II.

Temperature	Waxed Wrappers.			Tissue Wrappers.			Unwrapped.		
	Sound	Mould	Per Cent. Sound	Sound.	Mould.	Per Cent. Sound.	Sound.	Mould.	Per Cent Sound.
34° F. . .	94	22	81	104	8	93	149	16	90
37° F. . . .	112	42	71	136	26	84	124	47	72

Table III. gives similar results in respect to fruit from Ballendella at three different temperatures

TABLE III

Temperature.	Tissue Wrappers.		Waxed Wrappers.		Unwrapped.	
	Number Examined.	Per Cent. Sound.	Numbers Examined.	Per Cent. Sound.	Numbers Examined.	Per Cent. Sound.
32° F .	216	90	196	39	134	76
37° F. . .	No figures	. .	188	23	178	60
40° F. . .	,,	. .	216	16	180	54

None of the oranges referred to in either table was sweated. Both tables show significant results in favour of the use of the ordinary tissue wrapping papers. The extent of the infection is not shown. In those wrapped in waxed papers frequently more than one area on the orange was affected, particularly in the Tresco fruit, where many areas were first infected by *Botrytis cinerea* followed by infection with one of the species of *Penicillium*.

In seeking a reason for the difference of results between the use of waxed and tissue wrappers, we find that the waxed wrapper retains the moisture transpired by the fruit. In store, in some cases beads of moisture may be observed inside the wrapper; this produces a high relative humidity in contact with the rind. It is a well-known fact that fungi, particularly the mould fungi, thrive in humid atmosphere. On the other hand, the tissue wrapper both on account of its dryness and porosity does not allow high relative humidities to be attained in the neighbourhood of the rind. Fruit that has been wrapped in tissue wrappers is much brighter in appearance than fruit which has been wrapped in waxed papers, an effect which may be ascribed to favorable humidity conditions about the fruit.

(3) THE "SWEATING" OF ORANGES.

The term "sweating" is applied to the process of removing portion of the moisture from the rind or oranges. Generally, this is accomplished by spreading out on a shelf immediately after picking. The period may vary from three days to a fortnight.

A study of this process on the keeping qualities of oranges has been made.

Table IV. gives the results of orange storage for twelve weeks with fruit from Riverside. Some of the fruit was sweated in the orchard for a fortnight before storage; these are compared with fruit treated similarly in other respects, but which were not sweated. No wrapping papers were used.

TABLE IV.

(*a*) "sweated," (*b*) not "sweated."

Chamber Number	Temperature. Degrees F.	Refrigerating System.	Sound.	Mould.	Per Cent
3 (*a*) ..	34	Direct Expansion	96	0	100
(*b*) ..			65	16	80
4 (*a*) ..	34	Air Circulation .	120	0	100
(*b*) ..			96	1	99
5 (*a*) ..	34	Direct Expansion and Air Circulation	75	0	100
(*b*) ..			103	2	98
6 (*a*) ..	37	,, ,, ,, ,,	100	1	99
(*b*) ..			76	4	95
7 (*a*) ..	37	Direct Expansion ..	168	0	100
(*b*) ..			75	9	89
8 (*a*) ..	37	Air Circulation .	140	0	100
(*b*) ..			90	0	100
22 (*a*) ..	40	,, ,, . .	384	12	97
(*b*) .			388	44	93

The results give evidence in favour of "sweating." It may be noticed that the fruit stored in the direct expansion chamber gave the highest percentage of mould for that temperature. Further results of "sweating" are given with fruit from Tresco in Table V.

TABLE V.—WASHINGTON NAVEL ORANGES FROM TRESCO.

Chamber.	Temperature. Degrees F.	Refrigerating System.	Sound.	Mould.	Per Cent. Sound.
No. 22 (*a*) sweated ..	40	Air Circulation ..	63	9	87
(*b*) not sweated ..	40	,, ,, ..	78	28	74
7 (*a*) sweated ..	37	Direct expansion	67	3	95
(*b*) not sweated ..	..	,, ,,	57	34	63

The value of "sweating" is well shown with this consignment.

The oranges from Tongala, as remarked previously, were subject to considerable loss from *Botrytis* infection. It is interesting to study the effect of "sweating" on the variety of mould flora. This comparison is made in Table VI.

TABLE VI.—WASHINGTON NAVEL ORANGES FROM TONGALA.

Showing the effect of "sweating" on the prevalence of the different species of mould. Both chambers are the air circulation type (*a*) "sweated" for seven days, (*b*) not "sweated."

Chamber	Temperature.	Numbers Examined	Numbers showing —			Per Cent Sound
			Botrytis	*Penicillium* following *Botrytis*	*Penicillium*.	
8 (*a*) sweated	37° F. ..	164	1	0	4	94
(*b*) not sweated	..	218	20	0	11	71
22 (*a*)..	40° F. ..	150	2	1	2	93
(*b*).	..	210	10	20	17	61

While demonstrating the value of "sweating," these results show that particularly good benefits will accrue from "sweating" in a district where *Botrytis* is prevalent on the trees, and is likely to cause damage to the fruit.

In order to study the use of a well-ventilated chamber for orange storage, several cases were stored in a long, cool passage, the temperature of which varied from 44° F to 50° F., and the relative humidity from 76% to 95%, averaged 79%. The fruit was examined after four weeks, and then removed to the experimental chambers to be examined eight weeks later, together with fruit that had remained in each of the experimental chambers for the whole period. The result of the analysis of the causes of wastage is given in Table VII.

TABLE VII.—WASHINGTON NAVEL ORANGES FROM TONGALA

A comparison between oranges stored in a ventilated passage for four weeks and then stored at different temperatures with "unsweated," continuously stored fruit; none of the fruit was wrapped

	40° F		37° F		34° F		Averages	
	Passage.	Ordinary Storage.	Passage	Ordinary Storage.	Passage.	Ordinary Storage.	Passage.	Ordinary Storage
Nos. examined	83	83	89	107	92	98	.	
Penicilliums	33	15	48	6	6	4	29	8
Botrytis	2	6	1	44	5	15	3	22
Botrytis followed by *Penicillium*	0	16	0	12	1	16	0	14
Per cent. sound ..	58	56	46	42	87	64	64	54

Of the *Penicilliums*, *P. digitatum* (the olive-green mould) was the most common species, especially in the fruit from the passage-way, where 90% of the wasted oranges were so affected. *P. italicum* (the blue-green mould) is the commonest species following a *Botrytis* infection.

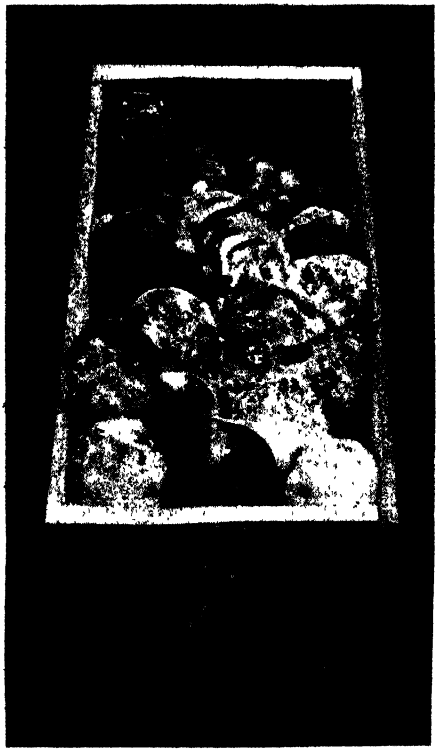
From a study of Tables VI. and VII. it is suggested that:—

(1) The relative humidity of the air is in immediate contact with oranges in a case serves as the limiting factor in the extent of the development of *Botrytis cinerea* on oranges. The relative

humidity is governed both by the moisture content of the rind, which, of course, is varied in the process of "sweating" and by the relative humidity of the air in the chamber.

(2) The temperature of the fruit and air in contact with the fruit serves as the limiting factor in the extent of the development of the citrus-rotting species of *Penicilliums* on oranges in cool store.

Grey mould, *Botrytis cinerea*, Pers., produces lesions on the wood of citrus trees Last year is the first year that this disease was reported as attacking the fruit. In cool storage its habit of growth makes it a serious disease to contend with. Here the mycelium, the vegetable portion of the fungus which is not noticed in twig infections, grows to infect other oranges in cases where they are not wrapped. An illustration of this growth in a case of oranges is given. When the fruit is wrapped in waxed papers, this mode of spreading does not occur.



Washington Navel Oranges affected by *Botrytis cinerea*, after eight weeks' cool storage, showing how the disease may spread in a case of "unsweated" oranges.

In view of the size of the spores and the millions produced, the chances of many spores alighting on each fruit of affected trees, or even where the other trees in a grove are affected, are considerable. Under favorable conditions each spore may grow, giving many points of infection.

It cannot be definitely stated whether an injury to the rind is necessary or not to produce the disease. If it is necessary, a very slight injury, which cannot be avoided in handling fruit, is sufficient.

Botrytis is very destructive to the rind, and spreads rapidly over it. It, however, does not penetrate the fruit to the same extent as the *Penicilliums* do.

The stalk end of the fruit is the commonest seat of infection, particularly if the fruit has not been " sweated " properly. The appearance of such oranges is described as " black eyed."

Some oranges which had been " sweated " lost the small stalk portion or button which is usually left on when the orange is removed from the tree. None of such oranges developed a " black eye," whereas other oranges which had been " sweated " for less lengthy periods, and which retained the buttons well, developed " black eye."

In districts where there is a possibility that *Botrytis* may develop on the fruit, it is recommended that oranges be " sweated " till the button is easily removed by hand, but not for so long that the buttons drop off of their own accord A fortnight is about the maximum period that will be required under the usual conditions prevailing during the picking season.

If the stalk ends become detached or are left too long, they may cause injury to other fruit in the case. Several instances of infection about the navel in Washington Navel oranges were observed; these proved to be due to injury from the stalk end of the orange immediately above the affected fruits.

It is difficult to compare the keeping qualities of oranges from different districts with such small consignments as were used in the experiments. So many factors other than the one under review enter in; it is not easy to distinguish and estimate the relative effects of each of these variables. The figures set out in Table VIII. may be of some service for comparative purposes.

TABLE VIII.

District.	Variety.	Stored at—				Age of Trees.	Main Cause of Loss.	Period Stored, in Days.	Remarks.
		32°	34°	37°	39°-40°				
Ballendella	W.N.O.	76	60	..	36	6	*Penicilliums*	97	..
Riverside (1)	.	99	92	..	875	...	,,	96	..
Riverside (2)	..	..	94	95	80	..	,,	90	" Spotted."
Tongala ..	.	89	87	53	52	6	*Botrytis* ..	108	
Tresco .		93	92	75	73	8	*Botrytis and Penicilliums*	94	
Barham ..	Late Val.	99	98	95	95	8	,,	106	" Spotted."

Of the Washington Navel oranges, the Riverside consignments stand out the most favorably. The weather at Riverside was much drier than at Tresco. In a period of about ten weeks only 90 points of rain fell. At Tresco in the same period about 5 inches fell. Riverside fruit was grown on grey Murray silt; the Tresco fruit on a red sandy hillside.

Late Valencia oranges store better than Washington Navel oranges. This seems to be a feature of the respective powers of resistance of their rinds to the inroads of fungi. Some consignments were packed in softwood cases, while others were packed in hardwood cases. As the consignments were drawn from different districts, it makes a comparison difficult; however, no effect which could definitely be referred to the particular type of case used was observed. The question as to the use of hardwood or softwood cases seems rather to involve questions of economy than of the relative keeping qualities of fruits in the different cases.

No special study has been made of handling methods. Since the "life" of oranges in store is determined to a large extent by certain mould fungi, most of which definitely require some injury to the rind before they can grow, the great importance of careful handling to prevent such injury is obvious. It is well to remember that even slight injury, a nail scratch, for instance, is a sufficient injury to allow a mould to develop. Too great care cannot be taken when handling the fruit which is intended for storing.

The "Spotting" or "Blotching" of Oranges.

A brown colouration of the rind, varying in its extent and regularity, sometimes occurs in oranges in cool store. Such discolourations may arise as the result of different causes. Included in this subject is the one determining factor in the cool storage of oranges of practical importance that is not due to any definite organism. Two causes of spotting or blotching are given, though these by no means exhaust the possibilities.

1. An infection by *Botrytis* which has for some reason become arrested; such areas are usually circular, small, dry, and slightly sunken. Oranges so affected are unsightly, and, although the disease will not spread on the removal of fruit from store, their sale is seriously affected.
2. Due to the injurious action of oils liberated from the rind.

That the oils liberated on injury of the rind of oranges caused "spotting" was suggested and studied by H. S. Fawcett.* A slight pressure is sufficient to press oil out of the surface glands of the rind in handling; this requisite pressure can hardly be avoided. Moisture in any form when present greatly extends the injurious effects. The moisture possibly carries the oil over larger areas, bringing about the more extensive injury. Unfortunately, no figures of the actual numbers affected were obtained. The following general observations help to confirm those made by Fawcett:—

1. More oranges were affected at 37° F. than at 32° F.
2. Oranges just picked and stored were affected worse than oranges that were "sweated" before storing.
3. Fruit picked and stored when moist "spot" badly.

Two consignments, previously referred to in different tables, were obtained from Riverside. Neither of these two consignments were "sweated," and both were treated as uniformly as possible, though one lot was forwarded six days before the other. The first was picked in clear, dry weather, the second in light and misty weather, although only about 12 points of rain fell during the interval between the respective forwardings.

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* H. S. Fawcett, Bull. 266, Agr. Exp. Stn., Berk., Cal.

are egg-shaped and have a triangular base; the flowers are in dense-clustered spikes, very mealy, and produce a great number of seeds.

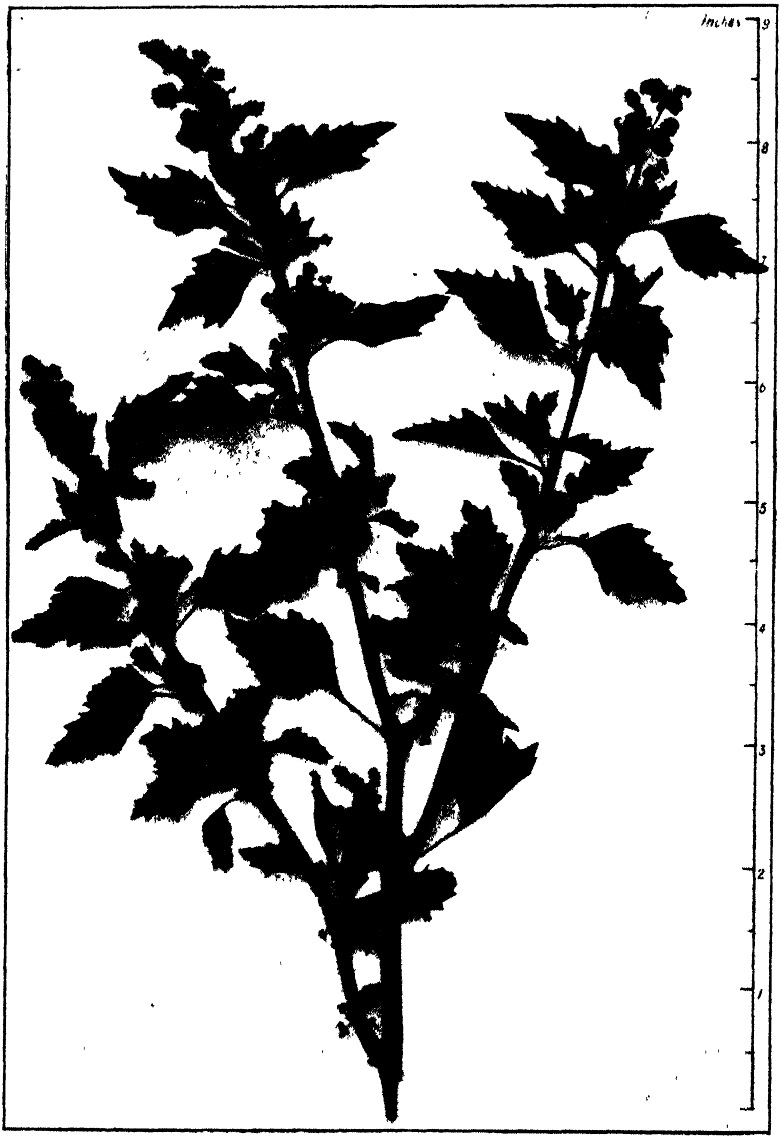

Fig. 62.—Nettle-leaved Goosefoot, *Chenopodium murale*, L.

The same treatment as recommended for Nettle-leaved Goosefoot should be effective against this plant.

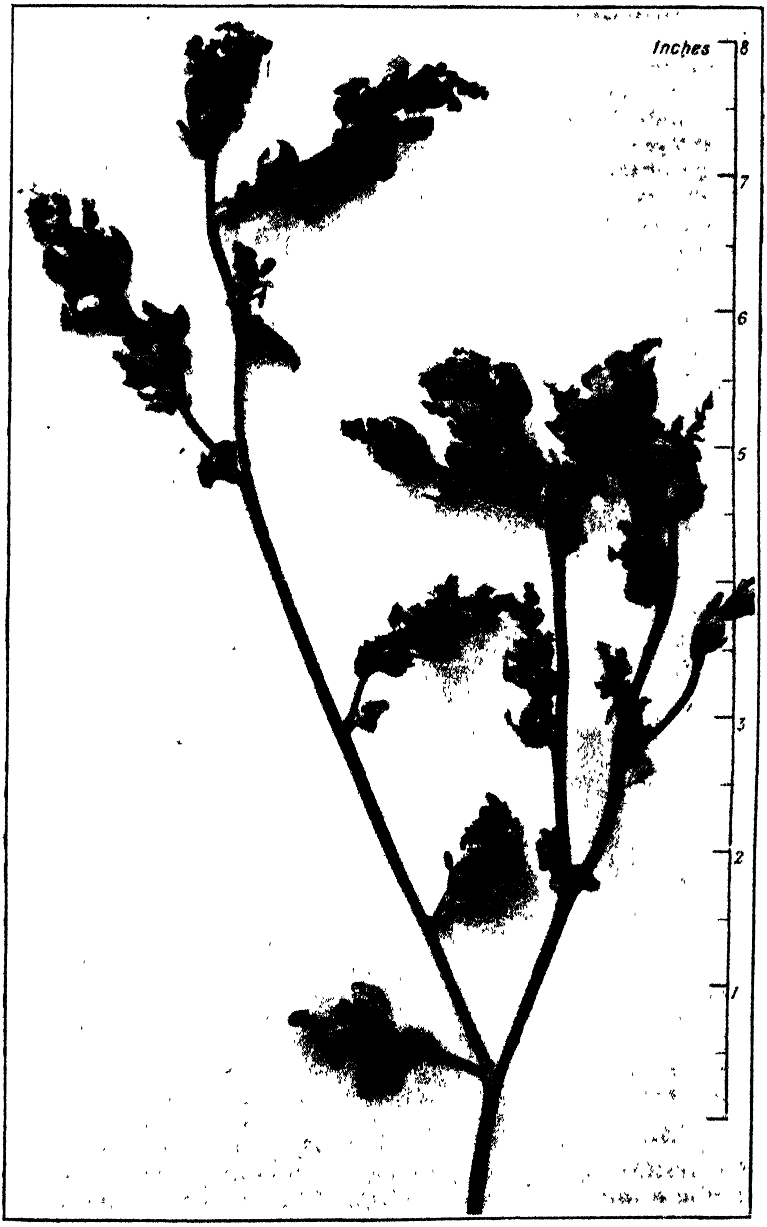

Fig. 63.—Stinking Goosefoot, *Chenopodium olidum*, C. Vulvaria L.

(*To be continued.*)

PLANTING AND RECONSTITUTION OF VINEYARDS.

Conditions Governing the Distribution of Phylloxera-Resistant Vine Rootlings and Cuttings.

The conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings (grafted and ungrafted) from the State Vine Nursery, at Wahgunyah, have been drawn up for the current year, and copies of same are available on application.

Beyond certain alterations of dates the conditions are much the same as for last season. There is no alteration in price.

It has, however, been found necessary to modify the closing dates for receiving applications. The last dates before which these must be made have been advanced one month, they will thus be: for grafted rootlings (1924 delivery), 31st May, 1923; and for ungrafted rootlings and cuttings (1923 delivery), 30th June, 1923. After these dates applicants can only be supplied in the event of there being a surplus after all regular applications have been satisfied.

Applicants are required to finally decide, when filling in their application forms, as to their stock and scion requirements; no amendment can be permitted later.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated, packing extra in the case of consignments forwarded by rail:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £12 (Deposit, 30s. per 1,000)

Resistant rootlings, ungrafted, at per 1,000, £3 (Deposit, 15s per 1,000).

Resistant cuttings, at per 1,000, £1 10s.

APPLICATION FORMS.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Manager, Viticultural Station, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings; (*b*) Ungrafted Rootlings and Cuttings. Applications must be filled in on the proper forms, and accompanied by a deposit as specified above.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings (grafted and ungrafted) and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with these. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

DATES BEFORE WHICH APPLICATIONS MUST BE MADE.

For Grafted Rootlings (1924 distribution, June to August inclusive), applications will be received until 31st May next. (For the 1923 distribution the time for receiving applications closed on the 30th June, 1922, and present applicants cannot be supplied until 1924.)

For Ungrafted Rootlings, to be distributed from July to August, 1923, inclusive, applications will be received until 30th June, 1923.

Applications for Cuttings will be received until 30th June, 1923.

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WATER REQUIREMENTS OF FARM CROPS.

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(Continued from page 284.)

RELATIONSHIP BETWEEN TRANSPIRATION AND ABSORPTION OF MINERAL NUTRIENTS.

The Soil Solution.

In soils maintained throughout the period of growth at from 50 to 60 per cent. of saturation, the soil water would be in slow but continual capillary movement over the soil particles in the form of films. As it is long in contact with the successive particles of soil, the soil water tends to form a saturated solution with respect to the mineral mass. This soil water is the nutrient medium for plant growth, and Cameron (1910) regards it as the culture solution for the plant.

Very little is known of the soil solution because of the great difficulty in getting it away from the soil. An aqueous extract of a soil has no definite or casual relation to the soil solution in the field. The concentration of a liquid solution in contact with a complex of absorbent and absorbed material is dependent on the relative masses of solution and solid. Thus the concentration of a solution with respect to phosphoric acid when brought into contact with basic phosphates of lime or iron is dependent in a marked way upon the proportion of solution to solid.

Hence an aqueous extract of a soil will vary in concentration with the proportion of water used, and with the same proportion of water different soils will yield different concentrations.

It is well known that potassium and phosphoric acid are absorbed to a very high degree by soils from dilute solutions.

Thus Voelcker (1864) filtered barnyard liquid through loams of various kinds, and found that most of the phosphoric acid in the liquid was speedily fixed by a moderate quantity of soil, though traces of phosphoric acid always remained in solution. He also showed that dilute solutions of potash salts were speedily fixed by small quantities of soil.

When potassium sulphate was added to a soil the potassium was precipitated, and an equivalent amount of calcium went into solution. Potassium phosphate undergoes a more complete precipitation.

Warington (1900) found that on adding ferric hydrate and aluminium hydrate to solutions of phosphate in carbonated water, 97 per cent. of the phosphoric acid had been abstracted from the solutions and deposited as phosphate of iron and alumina, while the whole of the lime remained dissolved.

Dyer (1901) was able to show by analyses of the soil from the unmanured and manured field plots at Rothamsted that the heavy dressings of superphosphate added to the manured plots since 1840 did not penetrate to the subsoil.

The ions NH_4, PO_4, and K are readily absorbed by the soil, whilst NO_3, SO_4, Cl, Mg, and Na are not precipitated. These latter are therefore the chief constituents of drainage water.

In view of the ready fixation of potash and phosphoric acid by the soil, it is to be expected that variations in the concentration of the natural soil solution in these ingredients would be less than in aqueous extracts when there is employed a constant and relatively large proportion of water to soil. Many attempts have been made to extract the solution naturally present in the soil and to analyze it. No pressure methods have been successful, but a centrifugal method has been adopted by Whitney and Cameron (1903).

By the use of powerful centrifugues with saturated soil Cameron and Whitney separated the excess of solution over and above the critical water content of the soil and analyzed it.

According to their views, soil particles are supposed to arise by disintegration, and to consist of the original minerals from which the rock was composed. Colloidal properties and clay properties begin to appear when the disintegration of the particles has gone so far as to become very minute. As most agricultural soils arise from the same minerals, they are therefore of similar chemical constitution, and the solution in contact with the particles, *i.e.*, the soil moisture, is of similar composition and concentration for all soils. They found that the amounts of phosphoric acid and potash in the soil solution were relatively constant for all soils, being 6-8 parts per million parts of solution for phosphoric acid and 20 to 30 parts per million of potash. The composition of the solution as regards nitrogen and lime, however, varied considerably with the different soils.

They further suppose that the concentration of any particular ion in the soil is not altered by the addition of soluble salts, any such addition only forcing out of solution a number of the ions already there. The soil solution is, in their view, the source of all fertility, and the function of the mineral particles is merely to hold up and distribute this solution. They further argue that this solution is unalterable in composition, and soluble fertilizers such as potassium salts do not increase the amount of food available for the plant, but owe their beneficial effects to indirect action such as the precipitation of toxic substances.

The mineral particles may certainly be regarded as the skeleton of the soil, but as Van Bemellen (1900) has pointed out, it is the colloids which impart to it many of its essential attributes.

Van Bemellen has shown that there is a close parallelism between the various interchanges and absorptions shown by the soil and those shown by colloids, and the only hypothesis capable of explaining the observed facts is that some of the constituents of the soil, and especially the clay, are colloidal. Both clay and humus can withdraw various ions, NH_4, K, and PO_4, from their solutions.

Russell (1912) regards the mineral particles, especially the fine silicate particles, as coated with a colloidal complex containing silica, alumina, ferric oxides, alkaline bases and phosphoric acid derived from the weathering of rock material and the humus, and that these various components are not in true chemical combination, but in a state of solid solution. The complex is decomposable by changes of temperature, concentration, and soil solution, but it decomposes continuously.

Whitney and Cameron assume the colloidal substances to be particles of any composition, provided only that they are small enough.

Van Bemellen regards the colloidal substances as decomposition products of weathered silicates. Whitney and Cameron assume that the soil solution is in equilibrium with definite silicates and constant in concentration, whilst Van Bemellen assumes it to be in equilibrium with a colloidal complex, and to depend for its concentration on the masses of constituents present in the complex.

The part which the total concentration of the solution takes in plant nutrition is not clear. Cameron contends that plants growing in water cultures are not influenced to any extent by wide variations in the total concentration of the solution. Tottingham (1914) concluded that nutrient solutions ranging from .01 to .14 per cent. do not affect the dry weight of wheat plants grown in these solutions.

Stiles (1915) considered that the individual variations of plants grown in water cultures is as large as or larger than that which is often accredited to a variation in the composition of the solution.

On the other hand, the results of researches of Hall, Brenchley, and Underwood (1914) were decidedly in contrast to the evidence cited above.

These investigators grew barley and wheat in solutions made by extracting the soils from certain Rothamsted plots on which wheat and barley had been grown for over 60 years. The comparative growth in the solutions was closely parallel to the growth of the crop on the plots in the field, and corresponded to the composition of the solutions. Moreover, growth in soil solutions agreed with the growth in artificial culture solutions containing equivalent amounts of phosphoric acid and potash. In nutritive solutions of varying degrees of dilution the growth of plants varied directly, but not proportionately, with the concentration of the solution, though the total plant food present in the solution was in excess of the requirements of the plant.

They concluded from their investigations (1) that the composition of the natural soil solution as regards phosphoric acid and potash is not constant, but varies significantly in accord with the composition of the soil and its past manurial history. (2) Within wide limits the rate of growth of a plant varies with the concentration of the nutritive solution, irrespective of the total amount of plant food available.

The results of Shive's experiments (1915) are of considerable interest in this connexion. Wheat was grown in solutions of three different total concentrations—1, 1.75, 4.0 atmospheres in terms of total possible osmotic pressure. The solution was the three-salt solution first used by Birner and Lucanus, containing $Ca\ (NO_3)_2$ $MgSO_4$ and KH_2PO_4. All possible sets of proportion of these salts were included for increments of change equal to one-tenth of the total osmotic pressure. As judged from the extensive quantitative date collected, Shive concluded that the growth of wheat plants in solutions of any given salt proportion was determined by the concentration of the medium.

We may conclude from the investigations of Hall and his associates, and Shive, that the composition of the soil solution which determines the growth of the plant is not constant, but is dependent upon the amount and the mode of combination of the phosphoric acid and potash in the soil, both of which *are* affected by the fertilizer supply.

Soil Solution and the Transpiration Ratio.

When plants are grown in nutrient solutions of varying concentration the water requirement is generally greater in the lowest concentrations. This was shown by Heinrich (1894), who grew oat plants in culture solutions of different concentrations. The nutrient solution consisted of calcium nitrate, magnesium sulphate, potassium phosphate, calcium chloride, and freshly precipitated suspended iron phosphate. Ten jars each of three litres were used for each of five concentrations. With the exception of the weakest concentration, the Transpiration Ratio decreased as the concentration of the solution increased.

Bouyoucous (1912) found that the concentration of the nutrient solution has a decided influence on transpiration the higher concentrations diminishing water loss either (1) because of the difficulty experienced by the plant in absorbing water from a solution of higher osmotic pressure; (2) because the increased concentration of the cell sap decreased vapour tension, and so reduced transpiration.

Hellriegel (1883) Germany; Widstoe (1909) U.S.A.; Leather (1910-11) India; Kiesselbach (1910) U.S.A.; conducted tests to show the effect of fertilizers on the Transpiration Ratio. In all these cases there was a considerable reduction in the water requirement brought about by the use of manures.

Kiesselbach measured the water requirement of corn grown in three types of soil—infertile, intermediate, and fertile, and showed that there was marked reduction in the water requirement with increase in soil fertility, and that fertilizers had a greater effect on the reduction of the water requirement in poor soil than in fertile soil.

In highly productive soils the reduction amounts to only a small percentage, but in poor soils the water requirement may be reduced by one-half or even by two-thirds.

Hoagland (1919) grew plants in a favorable nutrient medium to a uniform stage of development, and then transferred them for short periods to solutions of varying concentration. He found that transpiration was greater from solutions of low concentrations. Absorption and transpiration took place independently, so that the solution under some circumstances might become either more or less concentrated, depending on the original concentration of the solution.

The investigations recorded in this paper show that the effect of a heavy dressing of a complete fertilizer was to materially lower the Transpiration Ratio, not only for dry matter, but for grain also.

The lowered water requirement brought about by the use of fertilizers is often explained by the assumption that in an infertile soil the nutrient soil solution is weak, and the crop must transpire large quantities of water to secure the necessary amount of nutrient, whereas in a fertile soil a more concentrated nutrient solution surrounds the soil particles, and a relatively small quantity of water is required to bring the necessary nutrients into the plants; that the plant exercises control over this transpiration rate, and can thereby control the amount of nutrients absorbed.

It is further assumed that the amount of nutrients taken up by the plant from the soil solution is proportional to the amount of water transpired, and that the amount of transpiration varies inversely with the density of the nutrient solution.

If the transpiration rate were dependent on the concentration of the soil solution, we should expect to find that plants showing a high water requirement would be richer in mineral nutrients than those with low Transpiration Ratios.

Sorghum, millet, and maize have much lower Transpiration Ratios than wheat or oats, but the composition of the ash of these crops bears no relationship to their relative Transpiration Ratios.

Hasselbring (1914) showed that tobacco plants grown in the open transpired 28 per cent. more water than those grown in the shade. The plants which absorbed and transpired the greater quantity of water contained the smaller percentage and smaller absolute quantity of ash.

It appears from Hasselbring's experiments that the absorption of salts by the roots is independent of the absorption of water, and that the transpiration stream does not exert an accelerating effect on absorption of salts.

Further, even the same crop differs very widely in its Transpiration Ratio when grown on the same soil, but at different periods of the year. Summer-grown wheat both at Werribee and Rutherglen has a 60 per cent. higher water requirement than the same variety of winter-grown wheat, but the composition of the two crops is practically identical.

Lucerne during January and February frequently has a water requirement from two to three times greater than that grown in August and September, but the variations in ash constituents of the crop are trifling in comparison with the difference in the Transpiration Ratio.

Generally speaking, the mineral matters occur in the plant in proportions quite different from the proportions found in the soil solution. Nor does the ash of plants contain all the mineral matters which occur in the soil solution. Aluminium for example is almost entirely absent from the majority of the plants, although it is abundantly present in nearly all soils, and many of its compounds are soluble.

The nutrition of the potato plant has already been discussed. Approximately 75 per cent. of the nitrogen, phosphoric acid, and potash was taken in by a potato crop in the first 58 days of its growth, notwithstanding the fact that during this period only half the total dry matter had been built up.

The march of transpiration for the potato is similar to that of other crops, and approaches a maximum near the flowering stage. The greater part of the nutrient material is absorbed during the first half of the crop's growth, considerably before the losses of water by transpiration approach the maximum. Hence it would appear that with the potato crop the period of maximum transpirational activity occurs when the intake of mineral solutes is relatively small.

These considerations force us to the conclusion that the absorption of nutrients by the roots is independent of the transpiration stream. The reduction in the amount of water transpired per unit of dry matter with a concentrated nutrient solution is due to a more uniform and vigorous growth of the plant rather than to a reduction in the rate of transpiration.

The amount of water transpired by crops grown in fertile soil or in a soil liberally supplied with fertilizers is actually greater than that transpired by the crop on the unmanured or infertile soil. This is due to the increased development of the plant and the greater transpiring surface.

In the liberally manured soil the crop continues to increase in dry matter in an economical manner throughout the whole of the time that it is transpiring water. In the unmanured or infertile soil the crop continues to transpire water, but is retarded by malnutrition, and the water cost of the dry matter produced is therefore exceptionally high.

The high water cost of dry matter produced may be caused by a deficiency of a single nutrient, *e.g.*, deficiency of available phosphoric acid in Australian soils. As the supply of such a nutrient approaches exhaustion the rate of growth as measured by carbon assimilation is greatly reduced, but there is no corresponding change in the transpiration rate, with the result that the water requirement of the crop is abnormally high.

EFFECT OF SEASON ON THE WATER REQUIREMENTS OF CROPS.

Reference has already been made to the effect of physical factors of environment on transpiration. It now remains to consider the influence of season on the water requirements grown under constant conditions so far as soil, fertilizer, and degree of moisture saturation are concerned.

Wheat, oats, barley, rye, peas, rape, mustard, tares, and lucerne were grown in Rutherglen silt loam in pots maintained at a uniform degree of soil saturation (60 per cent. of water holding capacity) for seasons 1915, 1916, 1918, 1919. Each experiment was conducted in triplicate. No results were obtained during season 1917 owing to unavoidable curtailment of experimental work due to the war. As the lucerne crops made their main growth during the summer months the results will be considered apart from those obtained from the winter-grown crops.

The results for season 1915 have already been considered. The results for the remaining three seasons are summarized below.

Table XVIII.

Water Transpired, Dry Matter Produced, and Transpiration Ratio for Farm Crops, Season 1916—Rutherglen Experiment Farm.

Series.	Crop	Water Transpired	Total Dry Matter	Weight of Seed	Transpiration Ratio.			
					Dry Matter.		Seed.	
		lbs	grms	grms.				
$A1_1$	Wheat (Federation)	86·05	96 47	34·180	404	366	1140	1045
$A1_2$	,, ,,	68·88	96·347	35·247	322		885	
$A1_3$	,, ,,	86·16	105·064	35·144	372		1111	
$A2_1$	Barley (Cape)	71·87	94·377	28·477	345	324	1143	1040
$A2_2$	,, ,,	74·50	103·708	34·638	325		975	
$A2_3$	,, ,,	62·72	93·738	27·588	303		1030	
$A3_1$	Oats (Algerian)	79·60	122·595	46·675	294	294	772	744
$A3_2$	,, ,,	91·72	148·333	60·543	280		686	
$A3_3$	,, ,,	94·05	137·945	54·965	309		775	
$A4_1$	Rye (Winter)	70·24	120·559	32·909	264	283	966	1096
$A4_2$	,, ,,	78·62	128·356	31·886	278		1117	
$A4_3$	,, ,,	80·62	118·150	30·100	307		1205	
$A5_2$	Rape (Essex)	41·14	50·635	..	369	384		
$A5_3$	,, ,,	41 50	53·340		353			
$A6_1$	Peas (Dun)	43·38	60·588	31·278	325	331	629	655
$A6_2$	,, ,,	43·30	59·501	28·826	330		681	
$A6_3$	,, ,,	45·60	60·985	31·650	339		654	
$A7_1$	Lucerne (Hunter River)	154·29	108·17	..	646	675	..	
$A7_2$	,, ,, ,,	163·32	112·47		659			
$A7_3$	,, ,, ,,	159·58	100·58		720			
$A8_1$	Vetches (Golden)	74·39	84·15	27·75	401	393	1216	1214
$A8_2$	,, ,,	74 92	90·22	30·818	377		1103	
$A8_3$	,, ,,	81·45	91·85	27·985	402		1322	
$A9_2$	Mustard	33·84	52·98	..	..		..	
$A9_3$	,,	29·68	47·41	..	..		.	

It is apparent that the water requirements of crops vary considerably from season to season, not only for the production of dry matter, but also for grain. It is clear that there is no such thing as a definite water requirement which is constant for any given crop. There is, as a matter of fact, a marked variation in the Transpiration Ratio in different years, due to natural climatic differences. Nor do the various crops always show the same relative water requirement for each season. For each type of crop there is at each stage of growth a combination of air temperature, water supply, humidity, which is most favorable for growth and heavy yield.

Crops which grow vigorously and receive no checks throughout growth will show a lower water requirement than crops which receive checks from over supply or shortage of soil moisture, malnutrition, disease, *e.g.*, rust, flagsmut, takeall with cereals, &c. As the seasons vary widely with respect to rainfall, air temperature, humidity, evaporation, and the incidence of fungoid diseases, it is to be expected that the water requirements will vary also.

TABLE XIX.—WATER TRANSPIRED, DRY MATTER PRODUCED, AND TRANSPIRATION RATIOS FOR FARM CROPS, SEASON 1918—RUTHERGLEN EXPERIMENT FARM.

Plot.	Crop	Water Lost.		Evaporation from Fallows.	Water Transpired.		Dry Matter in—						Transpiration Ratio			
							Straw.		Grain.		Total.		Dry Matter.		Grain	
		lbs		lbs	lbs		grams		grams.		grams.					
$A1_1$	Wheat (Federation)	102·25	112·25	3·09	99·16	109·16	74·02	81·88	33·03	37·24	107·05	119·12	419	415	1362	1332
$A2_2$	,, ,,	111·5		,,	108·41		82·10		39·37		121·47		404		1250	
$A1_3$	,, ,,	123·0		,,	119·91		89·53		39·31		128·84		421		1384	
$A2_1$	Barley (Cape)	157·5	147·58	3·09	154·41	144·47	120·29	112·26	79·78	69·13	200·07	181·39	350	362	878	955
$A2_2$	,, ,,	147·0		..	143·91		113·83		67·35		181·18		360		970	
$A2_3$	,, ,,	138·25		..	135·16		102·67		60·25		162·92		376		1018	
$A3_1$	Oats (Algerian)	123·25	126·50	3·09	120·16	123·41	93·5	96·73	49·70	50·63	143·2	147·36	381	380	1097	1106
$A3_2$	,, ,,	134·00		,,	130·91		104·07		52·15		156·22		380		1142	
$A3_3$	,, ,,	122·25		,,	119·16		92·62		50·06		142·68		380		1080	
$A4_1$	Rye (Winter)	148·00	120·67	3·09	144·91	117·58	97·18	75·28	44·10	33·94	141·28	109·19	464	495	1492	1595
$A4_2$	,, ,,	79·00		..	75·91		43·63		20·42		64·05		531		1687	
$A4_3$	.. ..	135·00		,,	131·91		84·95		37·30		122·25		490		1606	
$A5_1$	Rape (Dwarf Sussex)	227·12	208·04	3·09	224·03	204·95	..		.		146·11	151·38	690	616	..	
$A5_2$	,, ,,	196·5		..	193·41						143·55		610			
$A5_3$	.. ,,	200·5		,,	197·41						164·47		543			
$A6_1$	Peas (Dun) ..	45·68	46·83	3·09	42·59	43·77	24·81	29·43	26·88	30·31	51·69	59·74	373	333	719	659
$A6_2$	.. ..	46·25		,,	43·16		30·01		31·32		61·33		318		626	
$A6_3$	.. ..	48·56		,,	45·57		33·47		32·47		66·21		308		631	
$A8_1$	Tares (Golden)	170·0	177·16	3·09	166·91	174·07	136·31	132·17	36·1	40·63	172·41	172·80	430	452	2099	1953
$A8_2$	,, ..	176·0		..	172·91		129·44		42·68		172·12		453		1839	
$A8_3$	,, ,,	185·5		,,	182·41		130·76		43·12		173·88		475		1920	
$A9_1$	Mustard ..	170·75	141·42	3·09	157·66	138·33	.		..		217·68	176·66	348	348	..	
$A9_2$	,, ..	170·25		..	167·16						194·70		388			
$A9_3$	,, ..	83·25		,,	80·16						117·60		308			

TABLE XX.—WATER TRANSPIRED, DRY MATTER PRODUCED, AND TRANSPIRATION RATIO FOR FARM CROPS. SEASON 1919 – RUTHERGLEN EXPERIMENT FARM.

Plot.	Crop.	Water Lost		Evaporation from Fallows.	Water Transpired		Dry Matter in—						Transpiration Ratio			
							Straw.		Grain.		Total.		Dry Matter		Grain	
A1	Wheat ..	lbs 106·00		lbs. 3·68	lbs 102·31		grams 53·09		grams 37·91		grams 91·00		510		1225	
A2₁	Barley ..	139·50	144·99	3·68	135·81	141·31	85·86	79·49	53·25	56·93	139·11	136 42	443	476	1158	1153
A2₂	" ..	144·75		"	141·06		82·60		68·85		151·45		423		930	
A2₃	" ..	150·93		"	147·00		70·00		48 70		118·70		562		1370	
A3₁	Oats ..	117·877	107·36	3·68	114·19	103·68	64·34	59·09	28 45	26·49	92·79	85·57	559	552	1822	1776
A3₂	" ..	99·25		"	95·57		50·01		24·41		74·41		583		1777	
A3₃	" ..	105·00		"	101·32		62·91		26·60		89·51		514		1729	
A4₁	Rye ..	154·12	159·71	3·68	150·44	156·03	83·01	88·74	33·35	32 47	116·36	121·21	587	585	2048	2216
A4₂	" ..	166·25		"	162·57		102·02		27·69		129·71		569		2665	
A4₃	" ..	158·75		"	155·07		81·20		36·37		117·57		599		1936	
A5₁	Rape ..	192·12	177·43	3·68	188·44	173·75	..		..		136·57	126·75	626	623	..	
A5₂	" ..	161·37		"	157·69						112·48		636			
A5₃	" ..	178·87		"	175·69						131·20		608			
A6₁	Pease ..	59 50	62·83	3·68	55·82	55·82	29·90	29·75	34·75	33·46	64·65	63·22	392	428	729	807
A6₂	" ..	68·50		"	64·82		34·19		36·68		70·87		415		802	
A6₃	" ..	60·50		"	56·82		25·17		28·97		54·14		476		890	
A8₁	Tares ..	83·37	100·04	3·68	79 69	96·36	34·17	37·06	14·05	17·04	48·22	54 10	750	806	2575	2568
A8₂	" ..	111·50		"	107·82		38·02		18·55		56·57		865		2639	
A8₃	" ..	105·25		"	101·57		39·00		18·52		57 52		802		2490	
A9₁	Mustard ..	115·25	125·25	3·68	111·57	121·56	..		..		88·26	94·37	574	553	..	
A9₂	" ..	132·75		"	109 07						94·28		525			
A9₃	" ..	127·75		"	124·07						100·56		560			

The water requirements of each crop for a period of four years and the average water requirements for the duration of the test are summarized in Table XXI.

Table XXI.

Average Dry Matter Produced and Transpiration Ratios for Dry Matter and Grain for Four Seasons—1915, 1916, 1918, 1919—Rutherglen Experiment Farm.

Crop.	1915.			1916			1918			1919			Average for Four Years.	
	Dry Matter.	Transpiration Ratio for—		Dry Matter	Transpiration Ratio for—		Dry Matter.	Transpiration Ratio for—		Dry Matter	Transpiration Ratio for—		Transpiration Ratio for—	
		Dry Matter.	Grain		Dry Matter.	Grain.		Dry Matter.	Grain		Dry Matter.	Grain.	Dry Matter	Grain
	grams.			grams			grams			grams				
Wheat ..	111·9	231	755	99·2	366	1,045	119·1	415	1,332	91·0	510	1,225	380	1,088
Barley ..	135·1	237	558	97·3	324	1,040	181·4	362	955	136·4	476	1.153	350	926
Oats ..	125·3	332	1,136	136·3	294	744	147·3	380	1,106	85·5	552	1,776	390	1.190
Rye ..	114·8	320	1,191	122·4	283	1.096	109·2	495	1,595	121·2	585	2.216	421	1,525
Peas ..	141·0	283	571	60·3	331	655	59·7	333	659	63·2	428	807	344	673
Rape ..	166·4	339	.	52·0	384	.	151·4	616	.	126·7	623	.	490	.
Mustard ..	84·3	464	..	50·2	287	.	176·6	348	.	94·4	553	..	414	
Tares ..	50·46	721	..	88·7	393		172·8	452		54·1	806	.	593	..
Average Transpiration Ratio each Season .		365	842	.	333	916	..	425	1.129		567	1,435	422	1,080

Table XXII.

Showing Average Water Requirements of Crops for Four Seasons and Intensity of Physical Factors during Period of Maximum Transpiration—Rutherglen Experiment Farm.

	1915	1916	1918	1919	Average for two Seasons, 1915–1916.	Average for two Dry Seasons. 1918 1919.
Average water requirement for eight crops tested (wheat, barley, oats, rye, peas, rape, mustard and tares) ..	366	333	425	567	350	496
Physical Factors.						
1. Evaporation from free water surface—						
(*a*) June to December (inches)	20·8	19·01	24·74	28·35	19 55	26·55
(*b*) October (inches) ..	3·54	3·37	3·73	4·93	3·45	4·33
(*c*) October to November (inches)	9·76	7·31	10·37	12·01	8·53	11·19
(*d*) October to December (inches)	13·79	13·46	18·79	21·78	13·62	19·33
2. Maximum Air Temperature (degrees F.)— Average for October-November	70·1	67·5	72·3	79·8	68·8	76·1
3. Mean Depression of Wet Bulb (degrees F.)— Average for October-November	4·95	4·5	5·45	7·15	4·72	6·30
4. Average Relative Humidity—October-November (per cent.)	68	72	65·5	59·5	70	62·5
5. Rainfall (inches)—						
(*a*) June to November (growing period) ..	13·86	23·42	9 51	6·05	18·64	7·78
(*b*) October to November ..	2·99	7·06	0·70	1·27	5 02	·94

Season 1915 gave on the whole the lowest Transpiration Ratio for grain, whilst 1916 gave the lowest average requirements for dry matter. For the four years during which the investigations were conducted season 1915 gave the lowest water requirement for wheat, barley, peas, and rape, whilst season 1916 showed the lowest water requirement for oats, rye, mustard, and vetches.

The Transpiration Ratios for all crops tested, both for dry matter and grain, were considerably higher during 1919 than during any other season. The water requirements for season 1918 were intermediate between the extremely high ratios of 1919 and the rather low ratios of 1915 and 1916.

Reviewing the seasons as a whole, it may be remarked that 1915 was a typical example of a good season for cereal crops. The rainfall was fairly uniformly distributed throughout the winter and spring months, while the ripening period (November-December) was characterized by uniformly dry, warm weather. There was a steady increase in air temperatures from mid-winter till harvest.

1916 was the wettest season on record, the average rainfall for the six months, June to November inclusive, being approximately 4 inches per month. During 1915, 1918, and 1919 the crops ripened during the first week of December. The 1916 ripening was delayed until the fourth week in December.

The period of maximum transpiration for the three years 1915, 1918, and 1919 occurred in October, but during the 1916 season the period of maximum transpiration was nearly a month later.

The seasonal conditions during 1918 were typical of a fairly dry season—moderate winter rainfall, light spring and summer rainfall. There was a marked increase in temperature during November, accompanied by increased depression of the wet bulb thermometer and increased evaporation.

The conditions prevailing in 1919 were those typical of a drought. The rainfall for the six months of the growing period—June to November, inclusive—was only 6.05 inches. There was a marked rise in temperature during October and November, accompanied by a marked wet bulb depression and greatly increased evaporation from a free water surface.

All the environmental factors tending to increased transpiration—air temperature, soil temperature, dryness of the atmosphere, evaporation, and number of hours of bright sunlight—were at a maximum during the period of greatest transpiration in season 1919 as compared with the three other years of the test.

The Transpiration Ratios for all crops tested during this season were higher than those of any other year. Thus the average water requirement for dry matter was 33 per cent. higher during the drought of 1919 than the dry season of 1918, and 62 per cent. higher than the mean water requirement for the two seasons 1915 and 1916.

There was a corresponding increase in the Transpiration Ratio for grain. The average water requirement for grain was 27 per cent. higher in 1919 than in 1918, and 62 per cent. higher than the average ratio for 1915 and 1916. The evaporation during October transpiration was 32 per cent. higher than in October, 1918, and 45 per cent. higher than the average evaporation for October, 1915 and 1916.

The results for the four years may be grouped into seasons of low, intermediate, and high water requirements. Seasons 1915 and 1916 gave low Transpiration Ratios, season 1918 intermediate water requirements, and 1919 was a year of high water requirements.

The water requirements show a fairly close agreement with the intensity of the physical factors. Thus 1915 and 1916 were years of high rainfall, and low evaporation from a free water surface. During the period of maximum transpiration the mean wet bulb depression and evaporation were relatively small, and air and soil temperatures were relatively low.

During 1919 the rainfall was light, evaporation intense. The period of maximum transpiration synchronized with relatively high air and soil temperatures, low humidity, and high evaporation.

Season 1918 was intermediate in regard to intensity of physical environmental factors—rainfall, evaporation, humidity, air temperature—between the droughty year 1919 and the seasons 1915 and 1916.

It is evident that the water requirement varies greatly in different seasons, due to natural climatic variations.

TABLE XXIII.

COMPARATIVE RAINFALL, EVAPORATION, MAXIMUM AIR TEMPERATURE, AND WET BULB DEPRESSION AND RELATIVE HUMIDITY FOR FOUR YEARS—1915, 1916, 1918, 1919, FOR GROWING PERIOD—RUTHERGLEN EXPERIMENT FARM.

	Rainfall.				Evaporation				Maximum Air Temperature				Wet Bulb Depression.				Relative Humidity			
	1915.	1916	1918	1919	1915	1916	1918	1919	1915	1916	1918	1919	1915	1916.	1918	1919	1915	1916	1918	1919.
	In.	In.	In.	In.	In	In.	In.	In	° F.	° F.	° F	° F.	° F	° F.	° F.	° F	%	%	%	%
June	3·61	3·98	2·47	1·55	1·17	1·14	0·97	1·05	53·8	52·7	55·8	56·4	1·4	1·0	0·7	1·0	88·0	92·0	95·0	92·0
July	1·98	4·39	1·24	0·75	1·96	1·05	0·99	1·16	55·1	53·6	52·2	55·5	0·9	1·5	0·6	2·4	93·0	87·0	92·0	76·0
August	2·91	3·65	3·79	1·30	1·58	1·21	1·34	1·55	55·7	54·6	58·2	58·8	1·4	1·1	1·0	1·6	88·0	91·0	91·0	86·0
September ..	2·37	4·34	1·31	1·18	2·67	2·15	2·64	2·83	61·3	64·9	64·7	65·7	2·1	3·2	3·0	2·5	85·0	77·0	77·0	82·0
October	2·81	3·64	0·58	0·68	3·54	3·37	3·73	4·93	65·6	65·8	64·5	75·2	4·6	4·5	4·3	5·4	69·0	72·0	72·0	66·0
November ..	0·18	3·42	0·12	0·59	6·21	3·94	6·64	7·07	74·6	69·2	80·2	84·3	5·3	4·5	6·6	8·9	67·0	72·0	59·0	53·0
Average .	2·31	3·9	1·59	1·01	2·85	2·14	2·72	3·10	61·0	60·1	62·6	66·0	2·5	2·6	2·7	3·6	81·7	81·8	81·0	75·8
October–November	1·50	3·53	0·35	0·64	4·88	3·66	5·19	6·0	70·1	67·5	72·3	79·7	4·95	4·5	5·45	7·15	68·0	72·0	65·5	59·5

In a season of low annual rainfall, with hot, dry, windy weather at the critical period of maximum transpiration, a given crop will show a higher water requirement than in a season of normal or liberal rainfall, with cool, humid conditions during the period of rapid transpiration. In many parts of the wheat belt the evaporation rate is subject to great temporary acceleration from strong, hot, dry, north winds in October and November. A few hours of hot northerly winds, coming as they are apt to do in dry seasons and periods of drought, may greatly accelerate the rate of transpiration and cause permanent injury and a lowering of yield to the grain crop.

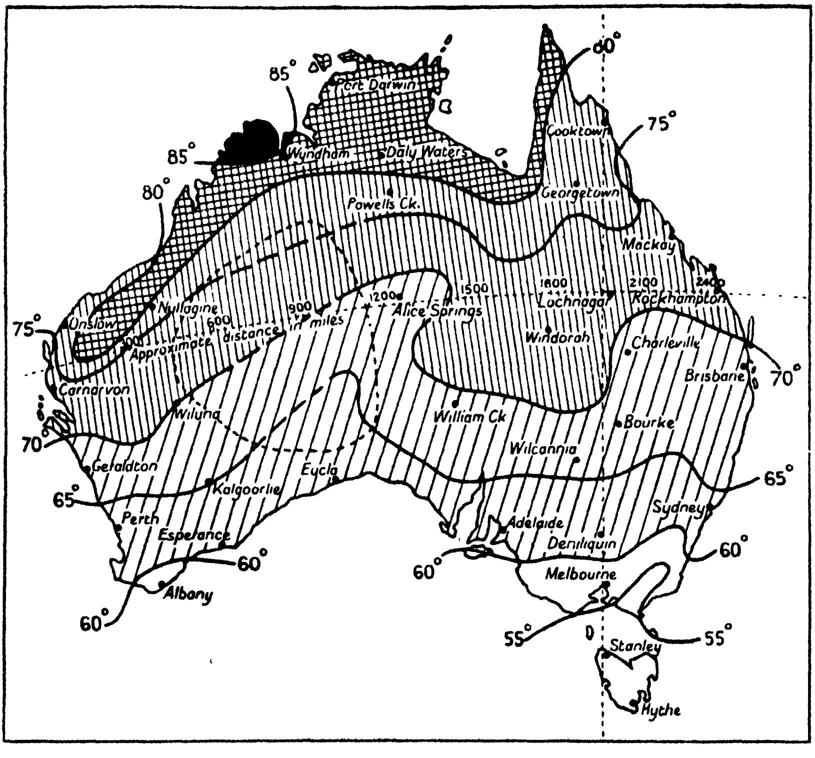


Fig. 21.—Map of Australia showing average annual temperature.
The dotted line in Western Australia includes the area with no stations. (After H. A. Hunt.)

Under these circumstances the Transpiration Ratio, both for grain and dry matter, will be much higher than in a normal season, or in seasons when dry spells occur, but unaccompanied by scorching northerly winds.

The evaporation from a free water surface is affected by atmospheric conditions in much the same way as the transpiration from the plant. The evaporation from a free water surface during the growing season, and particularly during the period of greatest transpiration, is an index to the amount of water transpired by a crop in any given locality.

Regions of low annual rainfall are usually regions of high evaporation. In such localities the Transpiration Ratios must necessarily be high, so that crops are likely to suffer the double disadvantage of shortage of rainfall and a high transpiration rate.

A knowledge of the rate of evaporation from a free water surface is thus as important as a knowledge of the rainfall and its incidence in determining the suitability of arid lands for settlement.

The water requirement of crops varies greatly with the climate. A low annual rainfall associated with a low evaporation rate may be of more value for crop production than a much higher annual rainfall in a region of high evaporation.

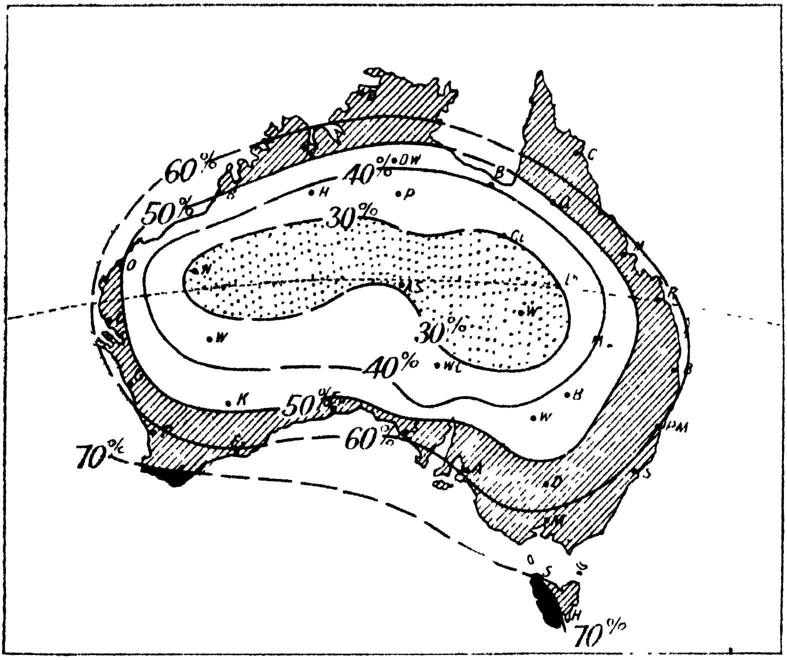


Fig. 22.—Map of Australia showing relative humidity for the month of October. (After H. A. Hunt.)

Evaporation from a free water surface is dependent on (1) temperature, (2) dryness of the atmosphere, (3) wind velocity.

The isotherms for Australia are shown in Fig. 21. The Wyndham region (Western Australia) has the highest average annual temperature, over 85 deg. F., whilst the average temperature progressively falls as we pass from the north-west coast of Australia to Tasmania, which lies within the 55 deg. isotherm. If evaporation were dependent only on temperature we should expect a steady increase in the annual evaporation as we pass from Tasmania to the Wyndham region. The annual evaporation from a free water surface in Tasmania is below 40 inches, the evaporation at Wyndham exceeds 80 inches. At the arid central region of Australia the evaporation exceeds 120 inches per annum. Thus at Boulia (South-West Queensland) the evaporation is 124½ inches.

The relative humidity of the atmosphere of a region has an important bearing on the evaporation. Normally the air contains only a percentage of the amount of water vapour it could retain if the maximum were available. This percentage is called the relative humidity of the atmosphere. The relative humidity is usually determined from the comparative readings of a wet and dry bulb thermometer.

The lines of equal humidity for Australia for October, the period of maximum transpiration for cereal crops, are shown in Fig. 22. They are, roughly, concentric, and more or less parallel with the coast line. The area of lowest humidity lies along the arid portion of Central Australia.

This area of lowest humidity moves north or south with the apparent movement of the sun from tropic to tropic, and during January its centre is near Oodnadatta (South Australia), and in July near Powell's Creek (Northern Territory).

In this area of low humidity or great dryness of the atmosphere the evaporation from a free water surface is greater than in any other region of Australia. Very few records are available as to the actual evaporation, but such as are available indicate an annual evaporation ranging from 100 to 120 inches. As the rainfall in this region is very light, usually less than 10 inches, and very unreliable, vegetation is extremely scanty, and consists mainly of stunted xerophytic species. The evaporation steadily increases as we pass from the southern coast to the arid interior.

The following table summarizes the evaporation from a free water surface at selected centres:—

TABLE XXIV.

SHOWING MEAN ANNUAL RAINFALL, MEAN ANNUAL EVAPORATION AND EVAPORATION FOR OCTOBER IN INCHES AT SELECTED CENTRES.

	Annual Rainfall	Evaporation, October.	Annual Evaporation
Hobart (Tasmania)	23.66	2.90	32.41
Sydney (New South Wales)	48.12	3.71	38.00
Melbourne (Victoria)	25.60	3.34	38.81
Werribee (Victoria)	20.50	4.06	46.19
Rutherglen (Victoria)	21.50	3.71	52.80
Adelaide (South Australia)	21.03	4 73	54.49
Perth (Western Australia)	33.10	5.27	66.13
Dubbo (New South Wales)	22.04	7.29	66.37
Broken Hill (New South Wales)	9.65	7.78	85.64
Coolgardie (Western Australia)	9.27	7.49	87.74
Alice Springs (Northern Territory)	10.99	9.55	94.84
Marble Bar (Western Australia)	14.24	11.30	115.34

Fig. 23 shows the isopleths of evaporation for Australia. They are, roughly, parallel with the coast lines, and concentric to an arid centre with its axis approximately along the tropic.

Along the southern coast line of the continent the evaporation varies from 40 to 60 inches. Along the northern coast the evaporation exceeds 80 inches, whilst the arid interior has an evaporation exceeding 100 inches.

The major rainfall regions of Australia are shown in Fig. 24.

The tropical "lows" or areas of low pressure affect the northern coast from November to April, whilst the Antarctic "lows" affect the southern coast from May to October. These give two prevalent types of rainfall in Australia—the former, called the monsoonal depressions, bring rain to tropical Australia during the summer, whilst the latter—the Antarctic depressions—bring rain to the temperate southern coast during the winter months.

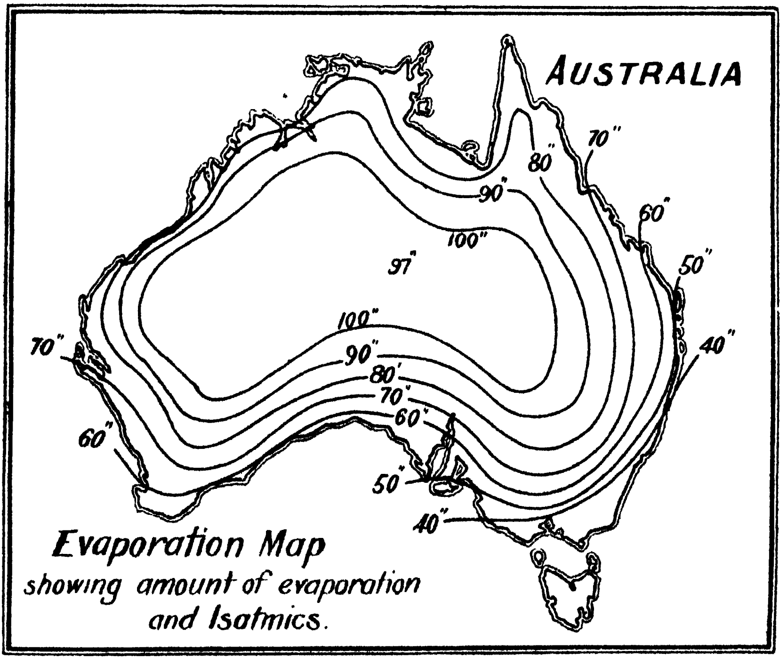


Fig. 23. Map of Australia showing lines of equal evaporation. (After H A Hunt.)

The maximum fall of rain in tropical Australia is usually in January. The wet season extends from November to March. The remainder of the year is relatively dry. In the south the maximum falls usually occur in July.

In Western Australia up to 90 per cent. of the total yearly precipitation falls from April to October—the growing period of the cereal crops. In South Australia 80 to 85 per cent. of the rain falls in the growing period of the crop, whilst the proportion of winter rainfall diminishes as we approach the eastern coastline.

Between Sydney and Melbourne there is an area of overlap of monsoonal and antarctic rains, and in this region the distribution of the rainfall is fairly uniform.

Of these major rainfall regions the most reliable, and therefore the most useful for agriculture is the southern rainfall area. The most reliable rainfall occurs in the south-western portion of the continent between Perth and Cape Leeuwin. Here the rains rarely vary more than 10 per cent. from the mean.

Over the greater part of the wheat belt the average variation from the normal rainfall ranges from 15 to 20 per cent. As we pass from the wheat belt to the pastoral area the rainfall reliability rapidly decreases, and in the arid centre of the continent the average departure from the normal exceeds 50 per cent.

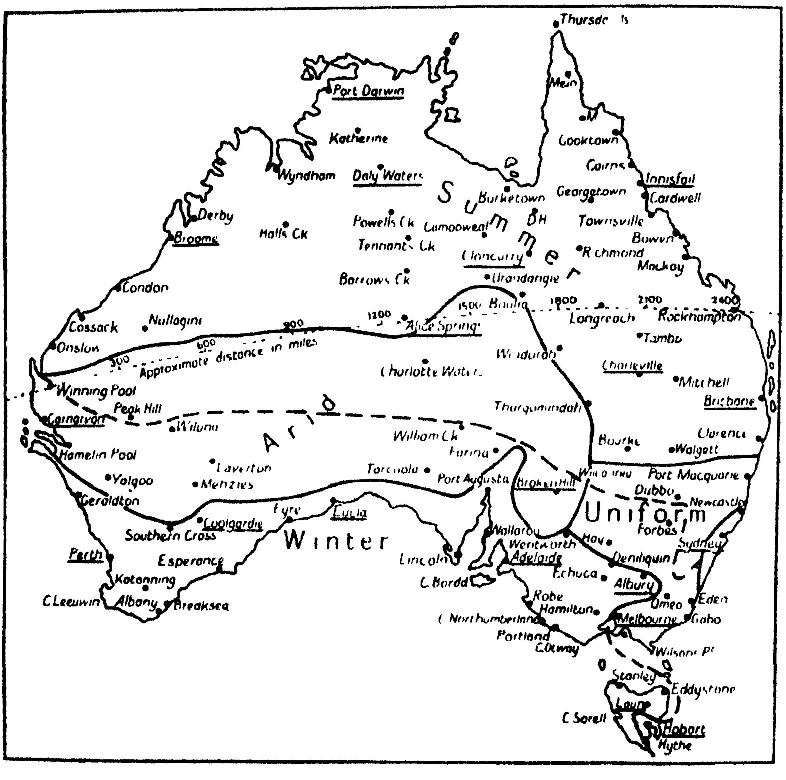


Fig. 24.--Map of Australia showing major rainfall regions.

The dotted line divides the summer and winter rain regions (After Griffith Taylor)

The rainfall reliability isopleths for Australia are shown in Fig. 25. As we pass from the southern coast to the interior (1) rainfall diminishes, (2) rainfall reliability decreases, (3) temperature increases, (4) relative humidity of the atmosphere decreases, (5) the rate of evaporation rapidly increases.

Hence successful crop production becomes increasingly difficult because of the lessened rainfall, the greater variability of the rainfall, and the increased Transpiration Ratio.

It is now clear that it is necessary to know something more of a region than its total rainfall or even the incidence of the rain in order to determine its suitability for agricultural settlement. The reliability of the rainfall must be taken into consideration, for the average annual rainfall may be the mean of a few years of very heavy rainfall with many years in which the fall is too light for crop production.

Finally, the average annual temperature and the relative humidity of the atmosphere are very important factors, for these directly influence the rate of evaporation, which in turn has a profound effect on the water requirements of farm crops.

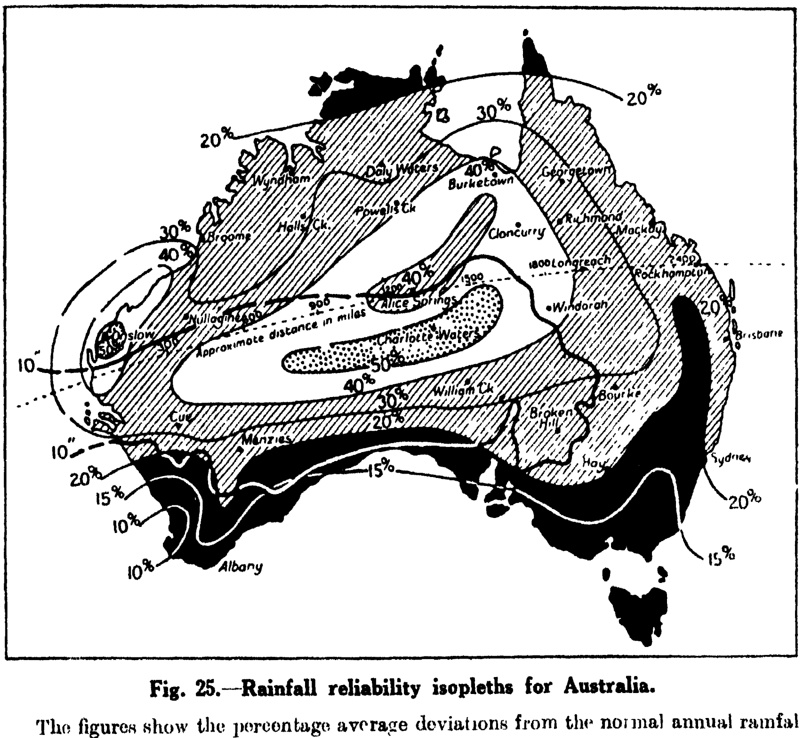


Fig. 25.—Rainfall reliability isopleths for Australia.

The figures show the percentage average deviations from the normal annual rainfall. The black areas have the most reliable and the dotted areas the least reliable rainfall (After Griffith Taylor.)

Regions of low evaporation are regions where crop production, measured in terms of rainfall, will be efficient. Regions with a high evaporation rate—the resultant of temperature, dryness of the atmosphere, and wind velocity—will necessarily show high Transpiration Ratios for all crops grown in the region. Hence crops grown in these latter regions must necessarily be produced at a high water cost.

(To be continued.)

PASSION FRUIT CULTURE IN VICTORIA.

(Continued from page 170.)

By J. Farrell, Orchard Supervisor.

IX.—Manuring.

Good cultivation keeps the soil mellow, moist, and sweet, enabling it to yield up freely to the vines the elements of plant food and in the proportions required by them. As with fruit trees, the plant food necessary for the passions consists mainly of nitrogen, phosphoric acid, and potash; and, for passion growing, the soil should be fairly rich in these. Continuous cropping, however, gradually exhausts and disarranges the balance of these ingredients, which, if not replenished and regulated by the application of suitable organic manures or fertilizers, soon causes the vines, especially when pruning is neglected, to show signs of fundamental fatigue.

The virgin soils in the passion fruit districts contain a fair amount of plant food, and the ingredients in same are usually nicely balanced. But the growth of the vines may be considerably improved, even on these soils, by the application of manures from the time of planting. The organic manures should be worked in during late winter or early spring as the grower desires, but the quicker-acting artificial fertilizers may be applied during the currency of the main period of growth, as occasion requires.

Stable manure is considered, on the whole, probably the best for passions, and it is only a matter of using a reasonable amount of this to obtain good growth and to keep the soil in nice condition. But with the artificial fertilizers the case is different, as growers, and especially beginners, are in most instances obliged to conduct rather lengthy experiments to determine the kinds of fertilizers which suit their soils best. A chemical analysis of samples of his soil enables the grower to considerably limit the duration of his experiments, and often to omit these manurial experiments, because in purchasing artificial manures he is in a position to secure the fertilizer containing the highest percentage of plant-food elements shown by the analysis as wanting in the soil.

Organic Manures.

Notwithstanding the relatively low percentages of plant-food elements contained in stable manure as compared with those found in the artificial fertilizer, when both commodities are analyzed bulk for bulk, the former, if procurable in sufficient quantities, should be used on the passion plot. Most of the soils in the passion fruit districts being rather too loose or open, their humus burns out quickly in hot weather. The superiority of stable manure over the fertilizer consists in not alone supplying a fair amount of plant food, but, because of its organic nature when incorporated in this loose soil, it replenishes the humus supply. In this way the correct physical and chemical condition of the soil is maintained; proper drainage and good cultivation are necessary, and an occasional dressing of lime counteracts acidity and favours beneficial soil bacteria in its activity. Under these favorable conditions the plant food is freely assimilated by the soil and made available in the proper form for absorption by the feeding roots.

Stable manure should be well rotted before being applied about October, as the chemical changes involved in its fermentation and decomposition take some time, and these changes should be as complete as possible prior to the manure's incorporation in the soil, so that the plant food may be made available as early as possible in the ensuing period of growth. It is even more essential to have manure intended for use later in the season thoroughly rotted prior to being applied, because the chemical changes necessary to provide the plant foods become relatively slower as the soil becomes drier.

Of the many points involved in determining the amount of stable manure necessary for a dressing, the following are the chief factors to be considered:—The physical nature of the soil and its condition of fertility, age, and size of the vines; amount of fruit produced the previous year and prospects of the coming season's crop. But, generally speaking, the best and most economical method of applying stable manure is to spread a layer of same, about 2 inches in thickness, over the whole of the vines' root-feeding areas during late winter, and plough in this when the soil is in a fit condition for working in early spring. Organic manures improve the physical condition of all soils, but this desirable improvement in structure is of relatively greater importance in the case of loose light loams, light sandy soils, and heavy tenacious clays than in others. These manures close up the open soils by adding humus, whereas the decayed organisms in the tenacious clays make them more friable. There is no rural industry in which a thorough knowledge of manurial benefits to the soil, and of the effects of manure on vegetation and cropping, is of greater advantage than in passion fruit culture.

ARTIFICIAL MANURES.

While the superiority of stable manure over the fertilizer is recognised, the distance separating the passion fruit localities from centres of population and stables attached to business establishments, where it is mostly produced, precludes its more general use. Moreover the great increase in motor traffic during recent years has had the effect of so considerably reducing the amount of stable manure available that growers, even in places fairly convenient for carriage by rail or carting, are obliged to resort largely to artificial fertilizers. Further, because of its obvious permanent future shortage, together with the ever-increasing cost of carriage and handling stable manure, growers will eventually be compelled to rely almost entirely on fertilizers with green manure to supply the humus. Planters' opinions often differ as to the best artificial manure for passion growing, but the fertilizers used in the various localities are generally selected as a result of experiments.

For the assistance of users of artificial manures, the *Fertilizers Act* 1915 requires all manufacturers and importers of fertilizers who intend offering same for sale to make application each year to the Director of Agriculture to have the respective brands of their fertilizers registered. Each application sets forth the name and place of business of the applicant, and the figure, trade mark, or other sign attached to or associated with the fertilizer. A statement is given of the results of a chemical analysis, showing the proportion per centum of the three ingredients contained in the fertilizer, the respective forms in which these occur, and the retail price per ton of the fertilizer. The worth of each fertilizer is calculated on its unit value or the value of 1 per cent. of nitrogen, phosphoric acid, or potash in a ton of the fertilizer as shown by the results of the chemical analysis. Mr. P. Rankin Scott, Chemist for Agriculture, prepares a list of the different registered brands with full particulars for publication annually. The latest list of fertilizers registered at the office of the Director of Agriculture under the Fertilizers Act appeared in this journal for January of this year, and a supplementary list in the journal for April. These lists should be read and studied by passion fruit growers and others interested in the use of artificial manures. Fortified by the knowledge derived from a perusal of the chemist's list, the grower would be enabled, when purchasing, to secure the fertilizer containing the highest percentages of the ingredients proved by experiment or shown by soil analysis to suit his soil best.

Under the heading of "pruning" it was stated that the trellis of vines illustrated in Fig. 11 were photographed on the 12th October, 1922, after the first plant in the row was pruned, and that at the end of the growing period another illustration of the vines would be made available for comparison with this. Fig. 17 is the reproduction of another photograph of these, taken on 16th March, 1923, showing lateral and foliage development during the intervening period.

GREEN MANURE.

As well as supplying plant food, green manure improves the physical condition of most soils on which passion fruit is grown. It helps to consolidate loose loams and sandy soils by supplying humus, and when incorporated in tenacious clay the decayed organic matter separates the particles and makes the soil more friable in character. Leguminous plants, such as peas, beans, vetches, &c., aided by the nodules on their roots, are capable of fixing more of their nitrogen direct from the air, and are consequently the best for green manure. Some passion growers use cereals, oats, wheat, &c., as cover crops, but these, on account of obtaining their nitrogen from the soil, cannot be regarded as equal to the leguminous ones, which replenish the supply of soil nitrogen when the process of decomposition is completed.

The field pea (*Pisum arvense*) makes one of the best cover crops for the passion plot. The seeds may be sown broadcast or in drills after the autumn ploughing, and harrowed in with a fair dressing of artificial manure, and during fairly mild winters the peas make good growth. The time of sowing the seeds should be regulated, so that the cover crop may assume its maximum of development and be in full bloom ready to plough under during October.

The Trifolium seedling illustrated in Fig. 18 (natural size) was seventeen days old when photographed, and shows nodules on its roots. The nodules marked (*a*) and (*b*) in the illustration were cut from the roots of a plant of the same variety eight weeks old, and these are also natural size.

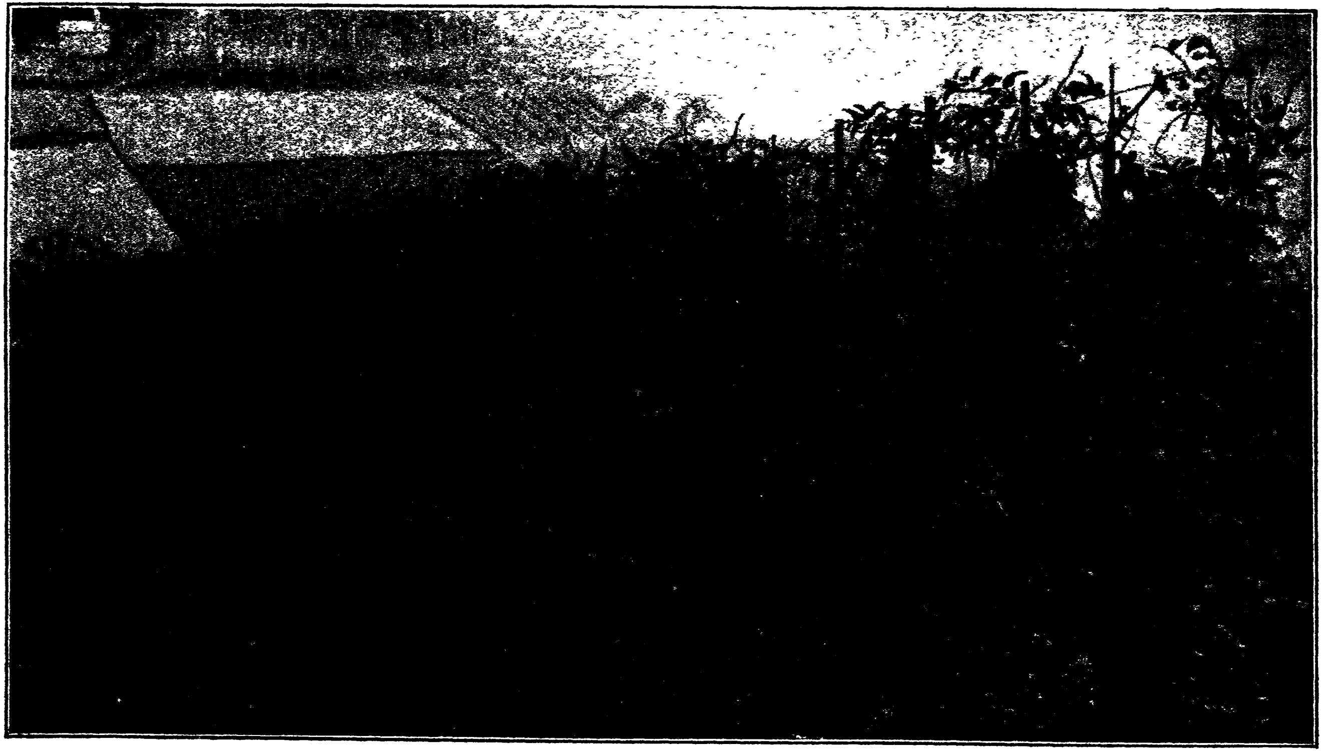


Fig. 17.—Trellis of Passion Vines (same as in Fig. 11, *Journal* of March, 1923, page 164) showing growth made by vines after pruning.

Heavier crops of peas are obtained when grown in drills than when the seed is sown broadcast, as the drill system permits of the soil being cultivated occasionally during late autumn and winter, when its condition is amenable to cultural treatment. The vines also benefit by this treatment of the peas, as they like the soil kept in an aerated sweet condition at all periods of the year. The peas should be ploughed in as soon as they have accumulated their maximum of cell sap, as later they become woody, in which condition they are less suitable as a green manure, and the process of decomposition is much slower. As the complete change from the green crop to that of the soluble and soil-assimilated elements of plant food rendered available for absorption by the feeding roots of the vines occupies a rather lengthy period, no time should be lost in ploughing the cover crop under when it has reached the proper stage of stem, foliage, flower, and nodule development. The peas on being ploughed under should be buried to a depth of from 4 to 6 inches, according to the depth of the surface soil. When cultivating with harrows afterwards to conserve moisture, which is such an important factor in preparing the elements of plant food contained in the vegetable matter for assimilation by the soil, care should be taken not to bring any of the green manure to the surface until it is thoroughly decomposed. Having given his attention to the different phases of green manuring, the passion grower may reasonably assume that the chemical changes necessary to render the soluble nitrates available will have made sufficient progress to assist the vines to commence vigorous growth, and afterwards supply food for fruit production.

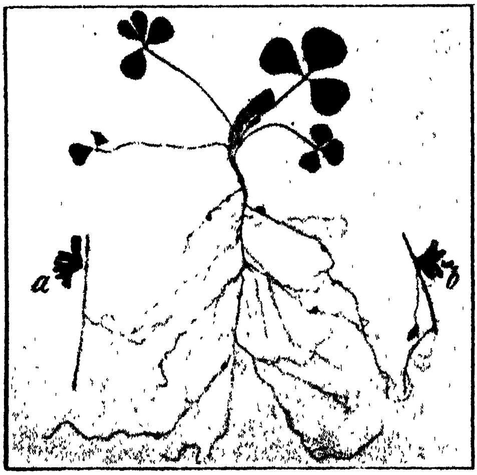


Fig. 18.—A Trifolium seedling, seventeen days old, showing nodules on roots (natural size).

a and *b* illustrate nodules (natural size) taken from a plant of the same variety, eight weeks old.

LIME AS A MANURE.

The passion vine likes a sweet soil, and most of the virgin land* now being brought under its cultivation is of this nature, but many plots develop acidity or sourness through the original lime content becoming depleted by continuous cultivation and cropping. Lime corrects acidity by uniting with the soil acids and changing them into harmless substances. It also supplies plant food and assists in liberating previously unavailable potash, thus creating a sweet healthy condition so essential to the profitable cultivation of this fruit. Lime also accelerates nitrification, the process by which the inorganic and unavailable nitrogen is rendered available by bacterial action.

Most practical passion growers are able to determine by the general appearance and results from their passion plots when the soil has developed acidity; and usually agricultural lime is employed to correct this. From 8 cwt. to 10 cwt. per acre spread over the root-feeding areas of the vines makes a nice dressing, and frequent light applications are preferable to occasional heavy ones. When it is known that soil sourness has been caused by stagnant water, lime should not be applied until the land is thoroughly drained.

A number of articles dealing with the use of lime, written by the departmental experts for this journal have been issued in bulletin form, and should be read by all passion fruit growers and others interested in the use of lime.

(*To be continued.*)

POULTRY AT STATE RESEARCH FARM, WERRIBEE.

NOTES FOR JUNE.

By W. Pederick, Poultry Foreman.

June is a Month of Preparation.

Stud birds are specially housed and fed so as to get them well through the moult, and in good order for the breeding pen. For this purpose sulphur and linseed are added to the mash.

The brooder house is put in order, and thoroughly disinfected with chloride of lime to insure a good clean start for this season's chickens.

The runs adjoining the brooder and chicken houses have been scarified up, and sown down with rye grass. This will sweeten the runs, and also induce nice green picking for the young chickens.

A supply of oats, barley, and rape to be used as green stuff for the winter, has been sown on land which has been well manured during the autumn. Crops for this purpose are usually sown earlier, but, owing to the dry season, the work had to be deferred.

Shelter trees have been trimmed back to allow as much sunlight as possible on the yards during the cold, wet weather.

A keen eye must be kept on all birds, perches, &c., for traces of vermin.

The pullets are laying very well, considering the cold, bleak weather, Leghorns in the test pens laying up to 25 eggs per month, and Orpingtons to 30 per month.

"Lady Hart," the Orpington pullet which laid 313 eggs for twelve months ended 13th March, 1923, had up to the 31st May laid 368 eggs

CROP AND FALLOW COMPETITION, RUPANYUP, 1922.

Report of Judge, H. A. Mullett, B.Ag.Sc., Senior Inspector of Agriculture.

The present competition is the fourth of its kind organized by the Society, and in submitting the report I desire to congratulate those responsible, on the success that has attended their efforts to promote the adoption of improved agricultural methods in the district. In particular, improvement is noticed in three directions, each of fundamental importance, in the growth of heavy crops of wheat.

IMPROVED SEED.

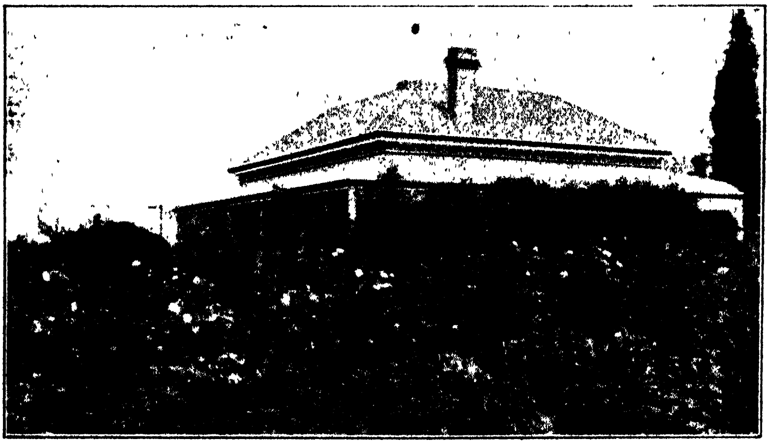
There is, for instance, a marked change for the better in the purity and type of wheat grown. Four years ago the judge of the first competition commented adversely on the type and purity of the wheat submitted to him. To-day both are deserving of nothing but praise. The change has been brought about by the enterprise of the Society in arranging to purchase pedigreed seed wheat from Longerenong College in truck lots. The wheat was allotted to individual farmers on arrival at Rupanyup, and formed the nucleus of the splendid samples now to be seen everywhere in the district. In making this statement it would be unjust not to refer to some crops grown from parcels of Federation originally purchased from private individuals, notably from Mr. Alec. Huf, of Jung. They were also exceptionally pure and true to type. During the past ten years the business in pedigreed seed wheat in the Wimmera has developed out of all knowledge. Once it was a rare thing for farmers to continue to purchase fresh seed of a variety from a seed station, now it is becoming the exception not to do so, and the demand is rapidly growing beyond the capacity of the seed stations. Unless means is found of supplementing the supply in future, some farmers may have to accept much smaller quantities than have hitherto been supplied them.

One method of meeting the increased demand would be for a few approved farmers in the Wimmera to purchase their seed from the College, multiply it and themselves grade it for sale. Up to the present little more has been done in this direction than for growers of pure seed to exchange it on their farms for an equivalent quantity deposited at the local railway station. Thus all their reward is a saving of cartage from farm to station. But first class graded seed ought to be worth at least from 1s. 6d. to 2s. a bushel above market price. And there does not appear to be any reason why specialists in the production of first class seed should not get these prices. Already the way is being pioneered. Mr. W. E. Dahlenburg, of Salisbury, who conducts the Departmental experimental plots there, and who thus derives his seed direct from the State Experimental Farms, has this year sold considerable quantities to local growers. At the annual field day held on this farm, those who attended were able incidentally to personally inspect the seed they proposed to purchase. But if the production of pure seed wheat is to pass in part into private hands adequate safeguards will have to be framed to insure that the wheat is subject to some system of improvement, that it is free from deleterious weeds and disease, and that it is true to name. There are a number of ways that will immediately suggest themselves as to how this can be done.

BETTER TILLAGE.

Another direction, equally important, in which marked improvement has been shown at Rupanyup, is in the tillage of the fallows. Summer-fallowing is rapidly increasing in popularity, and careful tillage after every rain of consequence, is the rule. The most successful competitors averaged ten to fourteen different tillage operations in preparing their fallow. One, Mr. W. Newall, of Marnoo, whose 60-acre paddock of wheat this year was considered equal to the heaviest seen in the district, had given the land upon which his crop was grown no less than eighteen separate workings. The ample reserves of moisture stored and the liberal supplies of plant food created in the soil by this intensive treatment can well be imagined.

An Attractive Farm Home – Mr. R. J. Jackson's, Rupanyup.



Garden and Home of Mrs. McAllister, Marnoo.

Good seed and better tillage have been rightly accompanied by the general use of heavier dressings of seed and of manure. From 75 to 85 lbs. of seed per acre with from 90 to 120 lbs. of superphosphate are now the popular quantities applied at Rupanyup, and these accord closely with the quantities that have given the best results at Longerenong College on similar soils. One competitor, Mr. Newall, used as high as 186 lbs. of superphosphate per acre on his crop, and Mr. C. Carra from 120 to 130 lbs. per acre.

The Competition, 1922.

In the three wheat sections, a total of 35 entries were inspected. In section 1, the Brunton Cup, eleven of the 23 competitors who started three years ago still remained in the field. In section 2, Best 60-acre paddock of wheat, there were nineteen competitors, and in the section for repatriated soldiers, five entries.

The Brunton Cup provided a most severe test, in that the whole of the crop grown during the past three seasons has been inspected and judged on points. Consistent success over large areas was therefore demanded of the competitors. During the currency of this competition, Rupanyup, with its extensive areas of friable black soil at Lallat and elsewhere, has enjoyed a satisfactory rainfall, though not an abnormally good one. The yield of the winner of the Brunton Cup for an average sowing of 275 acres has probably been very close to 40 bushels per acre, which speaks eloquently of his skill.

Heavy Crop of Federation Wheat, grown by Mr. R. J. Jackson, Rupanyup, winner of the Brunton Cup.

The rainfall at Rupanyup for 1922 was 17.67 inches, and that at Marnoo, 16.60 inches. The Autumn was dry; May and June were good months; July was dry, and September exceptionally good.

The distribution at Rupanyup was as follows:—

January, 30 points; February, 70; March, 2; April, 92; May, 324; June, 228; July, 82; August, 177; September, 339; October, 180; November, 18; December, 225; Total, 17.67 inches.

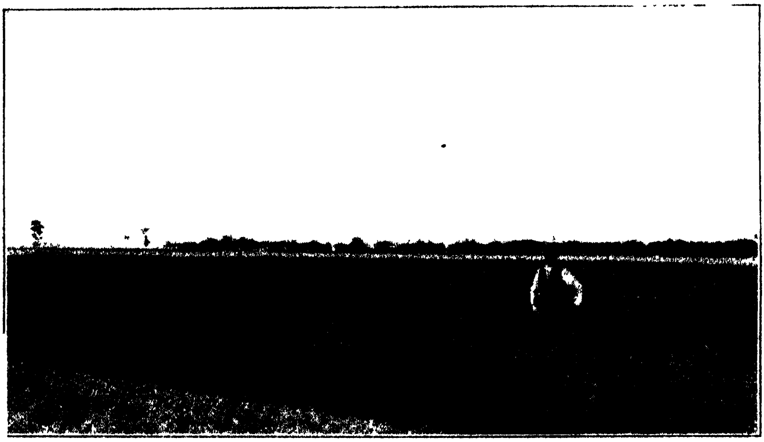
Frost occurred on 4th November, and caused some loss, though not over so extensive an area as at Nhill and Jung. On the whole, the yields, though good, were not as satisfactory as during the preceding year.

Results.

SECTION 1—BRUNTON CUP.

For the whole of the wheat sown 1920, 1921, 1922. *No area to be less than* 100 *acres.*

The winner of the section was Mr. R. J. Jackson, of Burrereo. He gained a total of 279 points out of a possible 300. His three crops have been wonderfully consistent. For an area of over 275 acres, as has been stated, the average yield has been 41 bushels per acre. Not only have the yields been high, but the crops have been remarkably even and regular There has been practically a complete absence of weeds, and the purity of the wheat was such that every bag could have been used for seed. The land, of course, is of a regular character over the whole of Mr. Jackson's farm, but that is not uncommon at Rupanyup, and on the Wimmera Plains generally. This particular soil, however, is of a somewhat lighter texture than that at Horsham, and Lallat. Mr. Jackson cultivates thoroughly, manures liberally, and uses good seed. He believes strongly in summer-fallow, and finds that it pays to till his black soil shallowly and with light implements. Often the plough is dispensed with for summer-fallowing, and reliance placed for cultivation on the scarifier, spring tooth cultivator and harrows. The heaviest paddock of wheat he grew in 1921, received 13 strokes of the various cultivating implements. Federation is the variety preferred, though a test has been made of Huf's Imperial with satisfactory results. This year 275 acres of wheat were inspected, half of which had been summer-fallowed and half winter-fallowed. The heaviest portion of the crop was grown partly on summer-fallow and partly on winter-fallow. The summer-fallowed portion was worked up lightly with the scarifier and disc cultivator in April. It was then harrowed twice. In September, the paddock was skim-ploughed and harrowed. In October, it was scarified and harrowed. It was left untouched save for sheep until the following April when it was harrowed. The dry Autumn did not permit of more working. In early June the paddock was scarified up, spring toothed and drilled early in July. The drill was followed by the harrows in order to cover the seed. From 90 to 95 lbs. of seed were used with 115 lbs. of superphosphate per acre.



Heavy Crop of Federation Wheat grown by Mr. John Sweetman, Rupanyup.

The runner-up was Mr. W. J. Hemphill, with 264 marks. He was closely followed by Mr. C. Carra with 261, and Mr. Gordon Hemphill with 260. The Brothers Hemphill cultivate their land with great thoroughness upon a system similar to that followed by Mr. Jackson.

This year the crop was sown with a combined-drill using 90 lbs. of seed with 112 lbs. of superphosphate.

On heavier land, though not of such consistently regular quality. Mr. C. Carra has produced some heavy crops of Federation. Summer-fallow is also thought highly of, and this year important differences in favour of the crops grown after this method of preparation were noticed on his farm. As befitting the heavier soil, reliance is placed on the plough for breaking up the land, and on scarifiers to perform the bulk of the rest of the cultivation. Little harrowing is done by Mr. Carra, as he claims that his soil is inclined to " blow " if reduced to too fine a tilth. Liberal dressings of seed and manure are used. The seed on this farm was originally derived from Mr. A. Huf, of Jung, and each year was excellent. The best paddock of wheat on the property was grown after the following treatment:—Ploughed in April to three inches deep. Scarified in July and subsequently re-scarified in July, in September, and again in November. After harvest it was harrowed, then scarified again at the end of May, and sown with the combined spring-toothed drill at the end of June. The harrows followed. Ninety lbs. of seed were used per acre with 130 lbs. of superphosphate The bulk of the wheat grown was Federation. There were also 60 acres of Huf's Imperial which looked well.

Details of Award.

Section 1.—Brunton Cup

For whole of the wheat sown 1920, 1921, 1922.

Limited to competitors growing at least 100 acres annually.

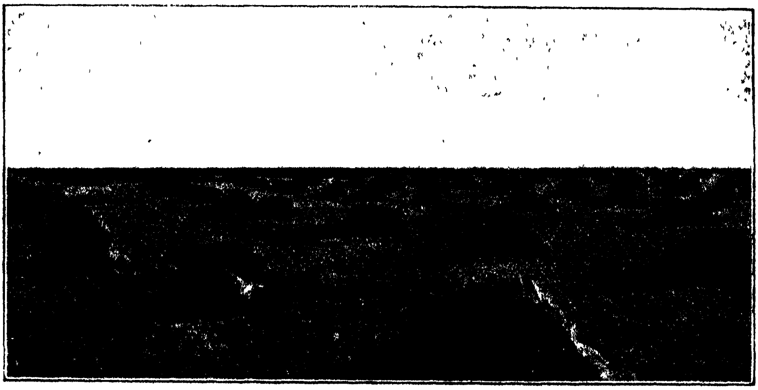
Name.	Yield.	Type.	Weeds.	Disease.	Evenness.	Total, 1922.	Handicap.	Total, 1920–21	Grand Total
Possible Points	**35**	**20**	**15**	**15**	**15**	**100**	..	**200**	**300**
R. J. Jackson ..	33	19	13	14	15	94	..	185	279
V. J. Hemphill ..	29	19	11	12	15	86	..	178	264
. Carra	35	18	12	14	14	93	..	168	261
. Hemphill	30	19	9	14	15	87	..	173	260
A. R. Dunlop .	26	20	7	13	13	79	..	179	258
. W. Ellard ..	32	19	12	11	14	88	.	160	248
arra Bros.	25	18	10	10	11	74	.	173	247
Miller Bros.	32	19	10	12	12	85	..	154	239
V. H. Kendell ..	31	17	12	11	12	83	2	154	239
. A. Graham ..	30	16	11	13	13	83	..	147	230
R. Duncan	25	19	10	11	12	77	1	145	223
Bell Bros.	..	..	With	drawn	..	..	.	170	..
H. Holcamp	..	..	With	drawn	..	..	..	163	..
A. McKinnon ..	..	..	With	drawn	..	..	..	162	..
. J. Crampton ..	..	..	With	drawn	..	..	..	160	..
eo. Chapman ..	..	..	With	drawn	..	..	..	160	..
. Chapman	..	..	With	drawn	..	..	..	1/9	..
eo. Kennedy ..	..	..	With	drawn	..	..	..	156	..
. Culton	..	..	With	drawn	..	..	..	152	..
D. Payne	..	..	With	drawn	..	..	..	152	..
R. Hurley	..	..	With	drawn	..	..	..	152	..
. Sweetman	..	..	With	drawn	..	..	..	136	..
A. Schafer	..	..	With	drawn	..	..	..	125	..

RESULT—SECTION 2.

For best paddock of wheat not less than 60 acres.

In this section some very heavy crops were submitted to the judge. The first prize was awarded to Messrs. Carra Bros. for a fine paddock of Federation wheat. This was not the heaviest crop seen, but it scored well in each subdivision. The wheat was clean and of excellent type. There was a complete absence of disease. The method adopted in preparing the fallow for and in seeding this crop has already been described

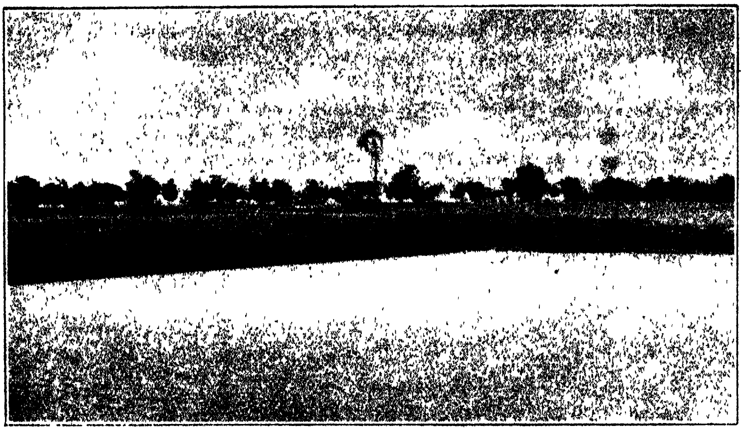
Mr. James Crampton was second with 95 points. The crop, Federation, had well-filled heads, and was level-topped and dense. The seed was derived direct from Longerenong College two years ago. The paddock of 150 acres was summer-fallowed in March to between 3 and 4 inches with the plough. In August part was re-ploughed where weeds were bad and part re-scarified. Then this was harrowed and subsequently scarified three times before harvest. In June, the paddock was re-scarified and sown at the end of the month with a combined spring-toothed drill and harrowed. Seventy lb.. of seed were used with 90 lbs of superphosphate.



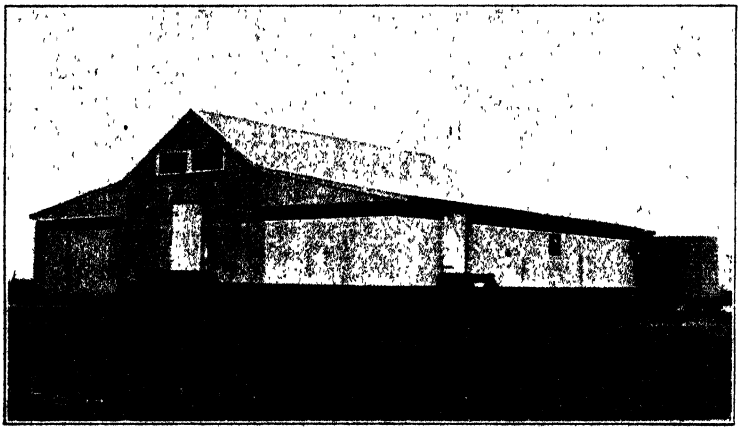
A Frosted Wheat Crop, cut for hay—Messrs. Dunlop Brothers, Rupanyup. This crop yielded over three tons per acre.

Mr. W. Newall's crop of Federation at Marnoo, awarded 94 marks, was heavier than the first two. The seed was derived from Longerenong College two years ago. The wheat was well-headed and. true to type. Several points were deducted for the presence of some wild oats. In view of the lighter rainfall received at Marnoo, the heavy yield secured was most commendable. It is undoubtedly due to a combination of thorough cultivation, seed of proved prolificacy and heavy dressings of fertilizer. The land was winter-fallowed in early August with a set plough to 3½ inches deep. It was then harrowed twice. In September it was scarified and twice harrowed, and similarly treated in October. In the following April, two harrowings were given. In May, a scarifying and two harrowings were given, and finally in June the paddock was scarified, harrowed, sown with a combined spring-toothed drill and harrowed. Seventy-five lbs. of seed were used with 186 lbs. of superphosphate an acre. Mr. Newall systematically follows up each scarifying with a double harrowing, the second one of which is done at right angles to the first.

Mrs. C. McAllister's crop of 120 acres was also at Marnoo. In this instance the land was summer-fallowed and no less than twelve different cultural operations were involved in preparing the fallow. The crop was sown in June with 60 lbs. of seed and 140 lbs. of superphosphate. This variety was Gallipoli. Points were deducted for the presence of a large percentage of foreign heads.



The Water Supply at Mrs. McAllister's, Marnoo.



Woolshed—Mr. D. McLennan's, Marnoo.

Mr. R. Miller's crop of 70 acres of Federation was remarkably well-headed, unusually deep in colour and possessed exceptional "bloom." The same characteristics were not observed in the wheat from an adjoining paddock on the same farm, and there was apparently nothing to account for the distinctive appearance of the crop except that it was sown with only 56 lbs of wheat per acre. This had the effect of rendering it less dense than is usually considered desirable. The paddock was summer-fallowed, prepared in March with a scarifier and subsequently worked only with the scarifier, harrows and spring-tooth. It was sown with a combined-drill during the first week in July—120 lbs. of superphosphate an acre were used.

DETAILS OF AWARD. SECTION 2—60 ACRES OF WHEAT IN ONE PADDOCK

Name.	Yield.	Trueness to Type.	Absence of Weeds.	Absence of Disease.	Evenness.	Total.
Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**
Carra Bros.	34	20	13	15	14	96
James Crampton ..	33	19	13	15	15	95
W. Newall	35	19	11	15	14	94
R. Miller	30	20	14	15	15	94
C. McAllister ..	35	13	15	15	15	93
R. Jackson	29	19	15	14	15	92
C. McAllister ..	28	17	13	15	15	88
J. Sweetman ..	30	19	10	15	14	88
W. H. Kendall ..	28	17	12	14	15	86
J. P. Loats	27	19	12	14	13	85
D. McLennan ..	25	17	12	14	15	83
A. Graham	26	19	12	13	13	83
Brown Bros... ..	22	19	14	11	15	81
J. Dunlop	26	19	9	13	14	81
W. J. Hemphill ..	21	19	11	12	15	78
G. Hemphill.. ..	20	19	10	14	15	78
G. Miller	27	20	8	11	11	77
A. R. Dunlop ..	21	20	8	13	13	75
R. Duncan	20	19	11	12	12	74

NOTE.—The points for yield do not represent bushels. The difference between them do. The highest yield was estimated at over 15 bags per acre.

RESULTS—SECTION 4A. FOR REPATRIATED SOLDIERS.

Wheat Crop on whole of fallowed land.

Mr. A. G. Swan was awarded first prize and 90 marks for an excellent crop of Federation wheat 120 acres in extent. The wheat was short, dense, and free from weeds. The land which was portion of the Warranooke Sheep Station was ploughed up in July and August, and twice harrowed in early September. It was scarified in October, and harrowed twice immediately afterwards. After harvest it was harrowed in March, spring-toothed-up with the combination drill and harrowed in May. Seventy lbs. of Federation wheat and 93 lbs. of superphosphate per acre were drilled in with a combined spring-toothed cultivator drill in June and July.

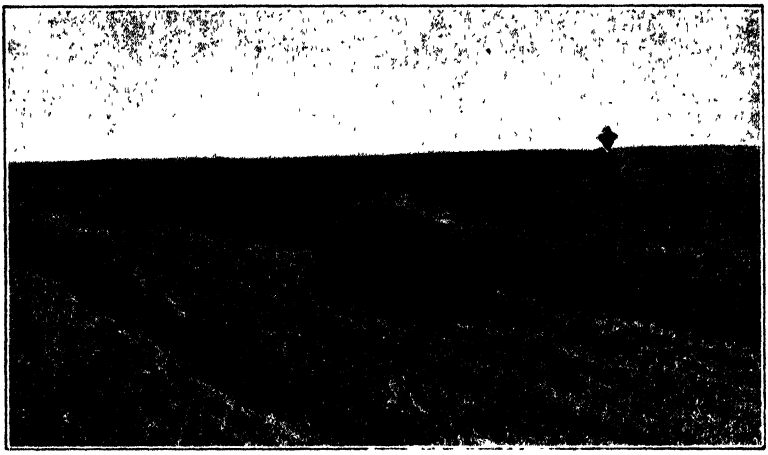
Mr. N. A. McLellan was second with 88 points. The crop was sown in May and June, from 75 lbs. to 80 lbs. of seed per acre and 93 lbs. of superphosphate being used.

Mr. E. T. Kendall's crop was a heavy one, but points were deducted for the presence of mustard and wild oats. The paddock contains some splendid black soil. The fallow was well-worked winter-fallow. Portion of Mr. J. H. Bates' crop was the heaviest grown by a returned soldier, but unfortunately the seeding of the balance, some 40 acres, was delayed until August with consequent reduction in yield.

DETAILS OF AWARD—SECTION 4A—FOR RETURNED SOLDIERS.

Wheat crop on whole of fallowed land.

Name.	Yield.	Trueness to Type.	Absence of Disease.	Absence of Weeds.	Evenness.	Total.
Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**
A. G. Swan	30	19	15	14	12	90
N. A. McLennan ..	27	18	14	15	14	88
G. C. Baylie ..	24	19	15	13	12	83
E. T. Kendall ..	30	18	12	10	12	82
J. H. Bato	29	16	15	12	10	82



A Returned Soldier's Crop on the Warranooke Estate, Rupanyup.

Fallowing Methods.

Each year the practice of summer-fallowing is proving more and more popular on the friable Wimmera soils. Farmers have found that the system pays. In former reports the convenience of summer-fallowing has been referred to at some length. The general success of the summer-fallowed crops in the competitions this year is further proof, if any is needed, that the practice also gives heavier yields. But it is not a good policy in point of convenience to attempt to prepare the whole of the fallow land as summer-fallow. Rather is it preferable to treat from 50 to 60 per cent. only in this way.

Now that the value of thorough tillage of the fallow while in a moist condition is so generally appreciated in the Wimmera, considerable interest is being manifested in methods of cultivation. A fallow consisting of some 2½ inches of loose mellow soil overlying a level, firmly-consolidated seed-bed is the accepted ideal. How to achieve that condition most economically is a debatable point. The orthodox method is to plough the land with a set-plough in March or April if summer-fallow, or July and August, if winter-fallow, then scarify the paddock as weeds appear, with an occasional harrowing. Usually two scarifyings are required, say in September and October, and two before the crop is sown in the autumn. As a matter of general observation, the crops grown on land double-scarified both in spring and autumn are generally more prolific than those once treated. The harrows, as a rule, follow the original ploughing and each scarifying. Some, like Mr. Newall, go further and harrow twice after each scarifying. Harrowing in February and March, should rain fall, is fairly general and in many instances there appears to be conclusive evidence of its value to the succeeding crop. Its value is especially noticeable in dry years. Now that the combined spring-tooth cultivator drill has become so popular, many farmers are using it to work over their fallows on all occasions where the weeds are too vigorous for the harrows, and where the soil is not firm enough, or weeds bad enough, to require a scarifier.

The skim-plough does not do such good work as the scarifier, and has practically being dispensed with on the black soils in the Wimmera. It does not cut rubbish as efficiently as the scarifier.

Discing "paddy-melons" on the fallow with disc cultivator drawn by tractor.

On some of the lighter soils, especially in the vicinity of Warracknabeal, a good deal of the fallow is prepared without the aid of the plough at all. Some of the crops so prepared at Warracknabeal this year were not as satisfactory as they might have been, but this was probably unconnected with the non-use of the plough, for, provided the work is done to a sufficient depth, the soil is cultivated just the same. Anyhow the plough in the sticky black soils of the Wimmera does little more than push the soil aside. There is no question of turning a sod. Some of Mr. Jackson's best crops have been grown without the aid of a plough. Of course, the continued use of this method will in a few years lead to increasing difficulty in securing a satisfactory depth of cultivation, owing to the gradual consolidation of the soil. Then recourse must be made to the plough.

The Fallows.

Patchy rain having fallen immediately prior to the judging of the crops in December, the inspection of the fallows was deferred till March.

In all eleven competitors submitted their fallows for inspection. All the entries were most meritorious, and were of such an even standard of excellence that there was considerable difficulty in separating the competitors. The test was, however, a most severe one, as no rain had fallen for three months, hence none but a well-mulched fallow could be expected to contain moisture. Yet all proved to have ample supplies. Indeed, in many cases at a depth of 8 inches, the clay loam was so moist that it could be moulded like putty in the hand. In general, where the most moisture was found, there the greatest skill had been displayed in cultivating the land. As a rule, the earlier the initial ploughing the moister the soil. Thus summer-fallowed paddocks were generally moister than those winter-fallowed. Another feature that most of the best fallows had in common was that the spring scarifying had been done in September—not delayed until late in October or early November. The early spring scarifying with its accompanying stroke or two of the harrows appears to be most effective in pugging together the loose black soil at a depth of 2 or 3 inches, so that a firm, well-packed seed-bed is formed.

Cutting "paddy-melons" on fallows at Rupanyup with "knife" attached to scarifier.

Almost all the fallows exhibited were free from weeds, but some others in the district were infested with paddy melons. While it is often claimed that good crops follow paddy melons, it is very probable that better crops will result if they are removed by harrowing while they are in the seedling stage. The V-shaped knife, if properly constructed and fitted to the scarifier will cut them when mature, but the vines may get entangled round the "feet" supporting the knife. Disc coulters may be fitted in such a way as to cut the plants into suitable lengths, and thus prevent the vines clinging to the knife and ridging the land. The disc cultivator is an objectionable implement to use on a fallow for cutting paddy melons late in the season. With it, it is difficult to avoid destroying the consolidated condition of the under layers of soil. Some fallows were noticed showing signs of extensive cracking. Harrowing is useful as a preventive.

Mr. C. Carra's Teams Summer-fallowing (Rupanyup).

Results.

Mr. A. Edmunds has been awarded 99 points and first place for an almost perfect fallow at Marnoo. The moisture content was exceptionally high, weeds were entirely absent, and the consolidation and the general level character of the soil at a depth of 2 inches were excellent. The mulch was fine and mellow, though a trifle shallow. The excellence of the fallow is attributable to the judgment with which it has been prepared and cultivated.

It was summer-fallowed with a scarifier in March, and then ploughed with a set-plough in June and harrowed. In September, it was scarified and then harrowed twice. Two further scarifyings were given in November as rubbish appeared. Subsequently, three additional strokes of the harrows were given. In all, there were eleven different operations involved in creating and maintaining the fallow up to the end of March. Seeded with judgment, it should grow an excellent crop.

Mr. R. T. Jackson, of Burrereo, the winner of the Brunton Cup last year, secured 96 points and second place. The fallow was not quite as high in moisture as that of the winner, but had an excellent mellow mulch, though like that of the winner, a trifle thin. The soil below the loose mulch was notably level and consolidated. The paddock, 180 acres, was ploughed to 4 inches deep in July and early August, then harrowed twice. In early October it was scarified, then harrowed. It was harrowed in January and again in February.

Portion of Mr. W. J. Hemphill's fallow was summer-fallowed in March to 4 inches, and portion winter-fallowed. Both paddocks were well worked.

Mr. J. P. Loats exhibited three paddocks, all of which were exceptionally well worked.

Mr. W. Newall's fallow had been worked over in all eleven times.

DETAILS OF AWARD.

Best half of Farmer's Fallowed Land.

Name.	Mulch	Moisture	Weeds.	Cultivation.	Total
Maximum Points ..	**25**	**25**	**25**	**25**	**100**
A. Edmunds . ..	25	24	25	25	99
R. J. Jackson	23	23	25	25	96
W. J Hemphill	23	23	25	24	95
J. P. Loats	22	23	25	24	94
W. Newall	22	22	25	24	93
John Sweetman	22	21	25	23	91
C. Carra	22	21	25	22	90
G. H. Kennedy	22	21	25	21	89
W. H. Kendall	23	20	22	24	89
A. Dunlop	20	22	24	20	86
A. Graham	22	20	20	20	82

WEEDS AND THEIR ERADICATION.

(Continued from p. 319.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Thorn Apple, *Datura Stramonium,* L. Family: *Solanaceæ.*

This common rank-smelling annual is supposed to have come originally from India, but is now almost a cosmopolitan species, and has a wide distribution in this State.

It has a partiality for good soils in which it will grow into a large, bushy herbaceous plant, sometimes 3 feet in height. It has large, irregular-shaped leaves. Solitary, short-stalked, long funnel-shaped flowers arise at the base of branches; these flowers are large, white-coloured, and conspicuous.

The prickly, oval seed capsules (*Fig.* 64), which the datura bears makes the plant easy of recognition.

In common with some others of the same genera, it is a highly poisonous plant, its seeds especially so, the toxic principle being Daturnine.

The inhalation of the smoke given off in the burning of the dried leaves of this plant is claimed to afford great relief to persons suffering from asthma.

This Datura may be easily suppressed by good cultivation, but care should be taken to prevent isolated plants from seeding; this may be done by hand-pulling them, or mowing them close to the ground before the seeds of the earliest capsules have ripened.

It is proclaimed under the Thistle Act for the whole State of Victoria.

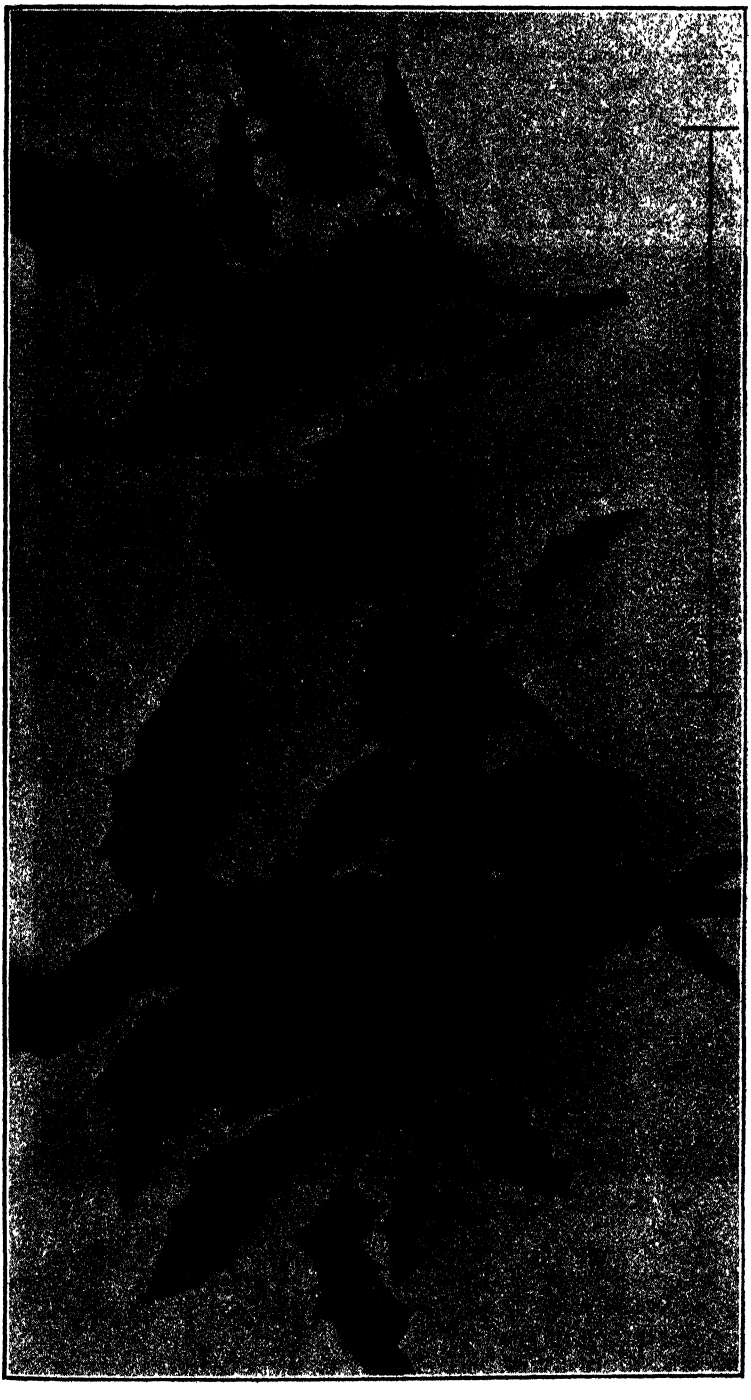


Fig. 64.—Thorn Apple, *Datura Stramonium*, L.

Blue Devil or Blue Eryngo, *Eryngium rostratum,* Cav. Family: *Umbelliferæ.*

This common spiny-leaved plant belongs to a genus that has a very wide distribution. Many species are both ornamental and beautiful; over forty have been described from different parts of the world, most of which are perennnials.

Our common native Eryngo, with its thistle-like flower heads of a blue colour, is a pretty species. Its stiff, spine-like leaves, make it an awkward plant to handle.

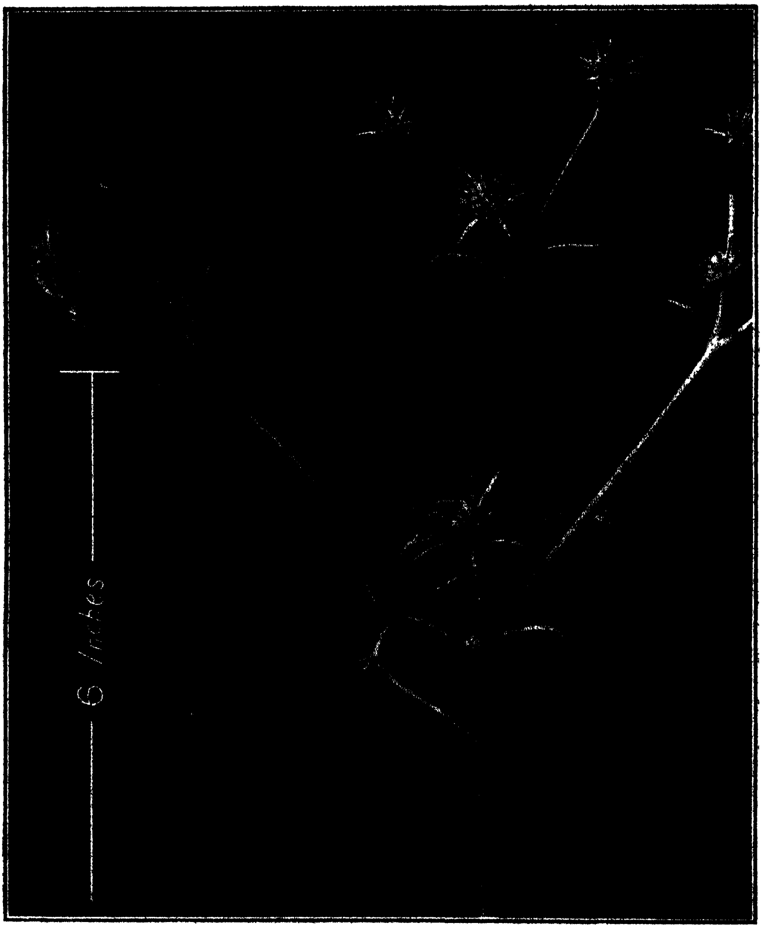


Fig. 65.—Blue Devil or Blue Eryngo, *Eryngium rostratum,* Cav.

The Blue Eryngo appears to have increased very much during the last few seasons in some localities, especially on grass lands. It should therefore be looked upon as an undesirable, and hoed or mattocked out before it has ripened its seed.

This plant can easily be recognised from the accompanying illustration (Fig. 65).

(*To be continued.*)

STANDARD COWS.

Report on Herd Testing for Quarter ended 31st March, 1923.

Number of cows which completed the list during the quarter, 188. Number which qualified for a certificate, 150.

Owner.	No. Completed.	No. Certificated.	Breed.	Name of Cow	Herd Book No.	Date of Calving.	Days in Test	Milk last Day.	Milk.	Average Test.	Butter Fat	Standard Required.	Estimated Butter.	Previous Yields of Butter Fat
								lbs	lbs		lbs.	lbs.	lbs.	
Mrs. I. Alston, Estate, Cobram	4	4	Jersey .	Pidgeon of Kameruka	6035	31 3 22	273	15½	6,585	6·04	397 95	250	453¾	384, 356, 409
				Romany Girl 3rd of Tarnpirr	Not yet allotted	13.5.22	273	11	4.670	6·41	299·48	200	341½	
				Bonnie Annie of Aberdour .	. .	29 5 22	273	13	4,178	5 43	226 78	175	258½	
				Welcome of Tarnpirr .	7069	27.5.22	273	16	5,428	6·45	350·20	250	399¼	411
J. Anderson, junior, Lyndhurst	1	1	Jersey .	Lady Monica 12th . . .	Not yet allotted	4.6 22	273	14	5.214	5·99	312·57	175	356¼	
W. K. Atkinson, Swan Hi	2	2	Shorthorn	Cherry 2nd of Willow Park. .	Not yet allotted	12.6 22	273	8½	4,304	4 25	182·83	175	208½	
				Bloom of Willow Park . .	. .	19.6 22	273	22½	7.621	3·83	292 03	175	333	
C Bamford, Benalla	11	11	Ayrshire	Bloomer of Medburn Grove .	8298	8 4 22	273	16	6,977	4·28	298 52	200	340¼	209
				Bonza of Medburn Grove . .	Not yet allotted	12 4 22	273	15	6.500	3 69	240·00	175	273½	
				Babe of Medburn Grove . .	6106	17 4.22	273	32½	11,921	3·99	475 22	250	541¾	283, 363
				Annie 2nd of Medburn Grove. .	Not yet allotted	17 4 22	273	17	6.507	4·23	275 06	175	313½	
				Linda of Medburn Grove .	8303	18.4 22	273	23½	9,059	3 92	355·47	200	405¼	284
				Bertha of Medburn Grove .	Not yet allotted	19.4 22	273	10½	5.840	4·45	259 91	175	296¼	
				Spot of Medburn Grove . .	8313	26 4 22	273	11½	6.449	4 45	286 78	200	291	265
				Lady Mac of Medburn Grove.	Not yet allotted	6.5 22	273	19½	6.670	4·40	296 15	175	337¾	
				Pansie of Medburn Grove .	4860	8 5 22	273	11	9.259	3·98	368 43	250	420	319, 338
				Lupin of Medburn Grove . .	4859	19 5 22	273	14½	8.536	3·89	332·10	250	378½	201, 282
				Miss Mac of Medburn Grove .	Not yet allotted	21 6 22	273	11½	6,066	4·33	262·63	175	299½	

Standard Herd Test—*continued.*

Owner.	No. Completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Yields of Butter Fat.
								lbs.	lbs.		lbs.	lbs.	lbs.	
A. E. Batson. Buckley	1	1	Jersey ..	Defender's Queen of Somerset	Not yet allotted	1 4.22	273	15	4,405	4 89	215·23	175	245¼	
Mrs. Irene Beard, Outtrim	1	1	Jersey ..	Brilliance of Kelburn ..	Not yet allotted	14.5.22	273	18	5 681	5·45	309 49	175	353	
J. Benallack, Elliminyt	2	1	Ayrshire	Adele of Cororooke House ..	7045	28.4.22	273	12½	4,549	4·05	184·21	175	210	
F. Bidgood, Staghorn	1	1	Jersey ..	Favourite 2nd of Staghorn ..	Not yet allotted	17 4.22	273	8½	4,494	4·65	209 17	175	238½	
Mrs. Agnes Black, Noorat	6	5	Jersey ..	Noorat Beauty* .. .. Noorat Marguerite .. .. Flashlight .. .. .. Noorat Peach . .. Shiela 5th .. .	6408 6413 1972 9218 3580	13.4.22 22.4.22 1.5.22 27.5.22 10.6.22	273 251 233 273 273	15 4 4 8½ 10	7,232 7,654 5,734 5,568 5,209	4·53 4·94 5·48 5·22 4·92	327·42 377 99 314 29 290·88 256·24	250 250 250 175 250	373¼ 432 358¼ 331¾ 292¼	256, 340 211 356, 388 294, 297, 268 215, 253, 257
A. A. Broad, Sutton Grange	1	1	Jersey ..	Roma of Hillcrest	7028	20 6.22	273	21½	8,723	4·32	376·53	250	429¼	
Callery Brothers, Bannockburn	1	1	Ayrshire	Roseleaf of Langley Park ..	4953	11 6.22	273	17½	8,676	4·54	393·84	250	449	285, 286
R. C. Campbell, Clarendon	1	1	Jersey ..	Queenie of Springvale ..	Not yet allotted	24.5.22	273	7½	4,745	5 95	282·50	175	322	

* Identical with Beauty of Condelo 3rd under which name she was previously tested.

STANDARD HERD TEST—*continued.*

Owner.	No. Completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk Last Day.	Milk	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Yields of Butter Fat.
								lbs.	lbs.		lbs	lbs	lbs.	
Mrs. M. E. Carroll, Tyntynder Central	1	1	Red Poll	Carolina ..	346B	17 6.22	273	10	4,873	4·30	209·73	175	239	
D. C. Cayley, Werribee	3	3	Ayrshire	Irene of Banyule	10221	21.4 22	264	4	6.888	4·00	275·51	250	314	
				Bloom of Banyule	6750	26.4.22	273	9½	7.467	4 22	315·19	200	359¼	
				Princess Thyra 4th of Strachan	6125	1 5.22	270	4	8.250	3·55	292·92	250	334	
P. Chirnside, Oakleigh	2	2	Jersey ..	Fox's Golden Cream ..	4722	6.4.22	273	16½	6.296	4·78	301 26	250	343½	
				Werribee Starbright 8th ..	6543	15 6.22	273	18	7,704	4·72	363·75	250	414¾	
W. T. Cullen, Warrion	3	2	Ayrshire	Dime of Riccarton	6496	10.5.22	235	4	5,422	4·96	269·15†	250	306¾	257, 260
				Docy of Riccarton	6497	24.5.22	248	4	7,111	3·78	269 12	250	306¾	257, 233
A. E. Denis, Swanpool	4	4	Jersey ..	Marise of Tarnpirr	Not yet allotted	1.5 22	256*	17½	5,176	5·16	267·03	175	304½	
				My Hope of Kameruka ..	6032	6.6 22	273	11	6,206	4·67	289·66	250	330¼	335, 336, 392
				Mistletoe 2nd of Tarnpirr ..	6030	17.6.22	273	11	7.592	5·42	411 54	250	469¼	450. 432
				Rarity 13th of Melrose ..	Not yet allotted	19.6.22	273	12	4,658	5·50	256·00	175	292	
Department of Agriculture	6	5	Red Poll	Battle Smoke	289B	1.4 22	235‡	16½	4,727	4 15	196·06	175	223½	
				Toronto	326B	4.4.22	273	19	6,160	4·32	265·97	250	303¼	210, 210
				Cutty	490D	19.4.22	240	7	5.910	4·50	265·90	250	303	287, 388, 454, 443, 442, 450
				Corona	382C	4.5.22	198*	16½	5,484	3·94	216·05	200	246½	237
				Hookah	392C	7.5.22	273	14	7,474	3·99	298·54	250	340½	244
	1	1	Friesian	Victoria Dutch Maid ..	Not yet allotted	23.5.22	273	9	6,351	3·85	244·30	200	278½	242

* Withdrawn before completing full term. † Short test because of mammitis ‡ Sold before completing full term.

STANDARD HERD TEST—*continued.*

Owner.	No. Completed.	No. Certificated.	Breed.	Name of Cow	Herd Book No	Date of Calving	Days in Test.	Milk Last Day.	Milk	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Yields of Butter Fat.
								lbs	lbs		lbs	lbs	lbs.	
Department of Agriculture	1	1	Jersey ..	Collingwood's Beauty ..	6749	28 3.22	273	19½	6,015	6.40	384·98	250	439	357, 257
C. Deverell, Wangaratta	3	3	Jersey ..	Gold Bell of Methven ..	9293	28 3.22	273	38	10.995	4 60	516·22	200	588½	413
				Lantana 2nd of Springhurst ..	Not yet allotted	30.4 22	273	19½	6.018	6 23	374 74	175	437¼	
				Brighton Princess of Springhurst	5391	13.5 22	273	15	9,138	4·82	440 69	250	502½	293, 270, 281, 509
C. Falkenberg, Elliminyt	4	2	Jersey ..	Hope 5th	2899	14.5.22	273	10	5.653	5·31	299·98	250	342	340, 372
				Empire 8th of Melrose ..	Not yet allotted	17.6 22	273	4	4,107	5·24	215·14	175	245¼	
R. Faragher, Koroit	3	3	Jersey ..	Bright Jewell 2nd of St Albans	5980	4 4.22	273	7	3,517	6·13	215·54	175	245¾	
				Clover of Saranac	9313	21 4 22	268	5	5,426	6·71	364·06	200	415	327
				Belle A . .	6315	21.4.22	273	8½	4,688	5·90	276·41	250	315¼	305
Flack and Sewell, Berwick	7	7	Friesian	Burnbank Woodcrest Segis ..	1085	28 3.22	273	26	10.669	3 62	386 34	175	440½	
				Dominion Queen Mercedes .	262	12 4.22	273	46½	15.958	3·69	589·53	250	672	352, 330
				Ashlyn 58 . .	Not yet allotted	21 4 22	210	26	6,103	4 36	266·03	175	303¼	
				Monovale Amethyst Paxton .	148	7 5 22	272	13	8,855	4·13	365·44	250	416¾	
				Burnbank Mercedes Flower .	486	9 5 22	270	10	4,515	3·95	178·18	175	203¼	
				Springfield White Posch ..	Not yet allotted	29 5 22	273	17½	7.612	3·89	295·80	200	337¼	217
				Burnbank Mercedes Violet ..	487	13 6 22	273	9	8.632	3·34	288·03	175	328¼	
Mrs. M. and W. A. Francis, Kilcunda	1	1	Ayrshire	Rose of Hillcrest	9079	24.5 22	273	6½	4,592	4·59	210 79	175	240¼	

Standard Herd Test—*continued.*

Owner.	No. Completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk Last Day.	Milk.	Average Test	Butter Fat.	Standard Required.	Estimted Butter.	Previous Yields of Butter Fat
								lbs.	lbs.		lbs.	lbs.	lbs.	
G. Gange, Mininera	4	2	Ayrshire	Azelia 2nd of Ferndale .. Alvie of Roseleigh	5931 7296	29 3.22 4.5.22	273 273	12 20	5,360 8,023	4 91 4·41	263·23 353·54	200 250	300 403	331
N. Gange, Mininera	3	2	Ayrshire	Petunia of Glencairn .. Flower of Roseleigh ..	4417 7299	31.5.22 15.6.22	273 249	18 4	8,998 5,274	3·96 4·16	355 88 219·44	250 200	405¾ 250¼	318 200
H. S. Gibson, Murraydale	2	2	Ayrshire	Dairymaid of Evergreen .. Flo of Evergreen	7317 Not yet allotted	12 6.22 18.6.22	273 273	15½ 11½	6,583 6,161	4·00 4·54	263·53 279·87	200 175	300½ 319	
R. Goodman, Kilmany South	2	1	Ayrshire	Flora of Roseneath ..	9132	1.4.22	273	15	5,769	4·35	250·75	250	286	
D. F. Griffiths, Inverleigh	3	3	Ayrshire	Nora of Gowrie Park .. Pearce's Heather of Struan Park Royal Heather of Gowrie Park	5184 Not yet allotted 5186	4.4 22 7.5 22 19.5.22	256 273 273	4 14 19½	6,166 5,290 8.914	4·24 4·49 3·56	261·41 237·75 317·74	250 175 250	298 271 362¼	
R. Hall, Sale ..	1	1	Ayrshire	Violet's Queen of Dunachton..	2922	17.4.22	273	16½	8,322	3 74	311·16	250	354¾	271
T. Harvey, Boisdale	3	3	Jersey ..	Kirsty 8th of Jerseyholm .. Kirsty 6th of Jerseyholm .. Empress of Jerseyholm ..	6846 4980 9393	1.4.22 7.4.22 8 6.22	273 273 273	18 19½ 18½	8,226 7,142 8,952	5 66 6·18 5·86	465·89 441·73 524·44	250 250 200	531 503½ 598	305, 395 347, 447, 414 400
A. E. Haughton, Heidelberg	1	1	Jersey ..	Laane's Fancy of Fairview ..	9397	20 5.22	273	17½	5,288	4·99	264·04	200	301	183

STANDARD HERD TEST—*continued.*

Owner	No. Completed.	No. Certificated.	Breed.	Name of Cow	Herd Book No.	Date of Calving	Days in Test.	Milk Last Day.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimted Butter.	Previous Yields of Butter Fat.
Dr. and Mrs. Henderson, Wangaratta	4	Nil	Jersey ..					lbs.	lbs		lbs	lbs	lbs	
	1	Nil	Red Poll											
W. Henderson, Grasmere	2	Nil	Ayrshire											
J. H. Hunter, Tyntynder Central	3	3	Jersey ..	Chevy 12th of Melrose .	6941	30 4.22	180*	26	5,635	6·22	350 32	250	399½	362. 456
				Rarity 11th of Melrose ..	6944	7 5 22	162*	24½	5,964	5·60	334·01	250	380¾	365, 403
				Peerless of Meadowvale ..	9408	29 5 22	151*	18	3,757	5·51	207·13	200	236	272
A. W. Jones, Whittington, near Geelong	7	7	Jersey ..	Maid 2nd of Linden ..	8437	15.4 22	273	13½	4,631	5 90	273·03	175	311¼	
				Fuchsia 13th of Melrose ..	6300	26 4 22	273	24	8.264	4·64	383·70	250	437½	355, 407, 439
				Lilac of Tarnpirr	6028	4 5.22	273	15	5,970	4·81	287 37	250	327½	325, 424
				Mermaid 2nd of St. Albans .	Not yet allotted	12.5.22	273	14½	4,285	5·50	235·85	175	269	
				Thelma of Meryula ..	5473	9.6 22	273	21½	8,139	4·97	404 64	250	461¼	
				Lady Grey 1st of St Albans..	4186	25.6.22	273	17	4,353	6 08	264·80	250	301¾	347, 409, 404, 466. 529, 464, 385
				Beautie of Tarnpirr ..	6023	25.6 22	273	13½	6,432	6 29	404 53	250	461¼	346, 475, 486
	6	6	Friesian	Melba	Not yet allotted	9.4 22	273	30	9,348	3·49	326 17	250	371¾	299, 366, 339
				St. Alban's Gem . ..	358	11.4.22	273	28	12,721	3·31	431·22	250	491½	312, 376
				Bloomfield Mutual Lassie ..	1037	14.4.22	273	10	7,785	3·83	297·84	175	339¾	
				St. Alban's Daisy	1038	5.5 22	273	21½	6.495	3 69	240·03	175	273¾	
				Nora's Pearl	363	27.5.22	269*	26	9,347	3·23	301·79	250	344	284, 354
				Bolobek Rose	319	29.5.22	273	22	9,840	3·54	346·20	250	394¾	284, 423, 449, 378

* Sold before completing full test.

STANDARD HERD TEST—*continued.*

Owner.	No. Completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk Last Day	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimted Butter.	Previous Yields of Butter Fat.
								lbs.	lbs.		lbs.	lbs.	lbs.	
Kerr Bros., Bacchus Marsh	5	4	Shorthorn	Morven Cressida .. .	Not yet allotted	20.5 22	273	26	9,000	4·08	367·60	250	418	292
				Lady Hayle 7th	,,	3.6.22	273	17½	6,451	3·69	237·51	175	271	
				Morven Duchess 14th ..	,,	15.6 22	273	7½	8,766	3·60	315·47	250	359¾	250, 290
				Morven Lizzie 7th	,,	17.6.22	273	10½	7,204	4·02	289·67	250	330¼	251, 258
A. Kirby, Daylesford	3	3	Ayrshire	Ada of Wattlebank ..	5311	6.4 22	273	15	5,731	4 45	255·11	250	291	240
				Lily of Wattlebank ..	9686	16.4.22	273	17½	5,722	4·47	256·05	175	292	
				Pride of Wattlebank ..	5315	21.5.22	273	19½	7.819	4·42	345·58	250	394	272
C. Lees, Lockington	1	1	Ayrshire	Heather of Range View ..	6658	28.3 22	273	14½	5,939	4 61	273 77	200	312	
H. Luxton, Whittlesea	3	3	Jersey ..	Lady Lene of Elouera .	9702	11.4.22	273	23	6,008	5·02	301·33	175	343½	
				Syringa of Springhurst ..	9665	17.5.22	273	8	4,502	6·24	280·87	200	320¼	221
				Grevillea of Springhurst ..	9655	17.5.22	273	22	6,806	5·87	399 27	200	455¼	
C. G. Lyon and R. R. Kerr, Heidelberg	2	1	Jersey ..	Hawthorn 5th of Banyule ..	5208	20 5.22	273	14½	7,162	5·22	373·96	250	426¼	286, 368, 394, 292
W. Macauley, Rochester	1	1	Jersey ..	Honey of Wanalta	7164	2.4.22	273	18½	5,552	4·95	274·64	200	313	269
R. H. Maher, Tongala	1	1	Jersey ..	Peerless 20th of Melrose .	9897	16.6.22	273	13	6,130	5·49	336·24	250	383¼	361
W. Meredith, Ondit	2	2	Ayrshire	Lilian of Willowvale ..	4650	25.4.22	273	6	7,287	4·28	311·75	250	355½	298
				Elsa of Willowvale	5360	24.5.22	251	4	5,268	4·85	255·75	250	291½	247

STANDARD HERD TEST—*continued.*

Owner.	No. Completed.	No. Certificated.	Breed	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk Last Day	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimted Butter.	Previous Yields of Butter Fat.
								lbs.	lbs.		lbs	lbs.	lbs.	
C. G. Newton, Kilmany South	1	1	Ayrshire	Peggy 3rd of Summerhill	5325	23 6 22	266	4	6,191	4 01	253 16	250	288½	262, 267
Mrs. Lilian Orchard	7	Nil	Jersey ..											
J. Platfuss, Tongala	1	1	Friesian	Westmere Oakwood Piebe	601	1.6 22	273	45	11,620	3·27	380 45	175	433¾	
F. Baggatt, Casterton	1	1	Jersey ..	Lassie 4th of Clover Flat	5485	20.5 22	273	16½	8,730	4 76	415·56	250	473¾	295, 357, 366, 307
R. Ralston, Moglonemby, near Euroa	3	3	Ayrshire	Opal of Ben Kell ..	6741	11.4.22	273	9	5,893	4·14	243 83	175	278	
				Begonia of Ben Kell ..	6730	5.5.22	273	13	5.951	4·17	248·35	175	283¼	
				Pearl of Ben Kell ..	3052	28.5 22	273	11½	7,658	4·02	307·96	250	351	337, 281, 326
J. D. Read, Springhurst	7	7	Jersey ..	Tuberose of Springhurst ..	Not yet allotted	3 4.22	273	26	6,127	5·07	310 86	175	354½	
				Belladonna of Springhurst	5389	4 4 22	273	22½	6,724	4·55	306 26	250	349¼	222, 253, 399
				Nightshade of Springhurst	3707	10.4.22	273	25½	8.095	4 58	371.12	250	423	297, 230, 410, 419, 425, 421, 283, 455
				Cornflower of Springhurst	7326	22.5 22	273	23	7,976	5·37	427·96	250	477¾	243, 385
				Clover of Springhurst	6201	24 5.22	273	10	6.640	5·34	354·62	250	404¼	263, 206, 366
				Boltonia of Springhurst	9449	10.6 22	273	16½	5,755	5·12	294·40	200	335¼	218
				Countess 2nd of Springhurst	9651	16.6 22	273	13	6,398	5·40	345·23	200	393½	290
Miss Bruce Reid, Bundoora	2	2	Jersey .	Jubilee Rosemary	Not yet allotted	5.5 22	273	16	4,894	5·00	244·79	175	279	
				Jubilee Periwinkle	9673	8.6 22	273	11½	4,453	5·86	261·02	250	297½	210

STANDARD HERD TEST—*continued.*

Owher.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Bays in Test	Milk last Day	Milk.	Average Test.	Butter Fat	Standard required	Estimated Butter.	Previous Yields of Butter Fat.
								lbs.	lbs.		lbs.	lbs.	lbs.	
C. J. Reid, Devenish	1	1	Jersey ..	Fuchsia 12th of Melrose .	6299	9 4 22	273	10½	6,868	4·86	333 85	250	380½	292, 361, 397
Miss S. L. Robinson, East Kew	4	2	Jersey ..	Sweet Pansy of Fairview	9681	12 6.22	273	4½	4.732	4·94	234 74	200	267½	
				Rocket of Ruhbank .	9348	12.6.22	273	4½	3,367	5·99	201·76	200	231	182
F. G. Sadler, Camperdown	6	3	Shorthorn	Holly Queen of Pentland 4th	Not yet allotted	28.4.22	249	4	9.008	3·96	356 31	250	406¼	306
				Pansy of Hillcrest ..	”	4 6.22	273	10	4.454	4·26	189·95	175	216½	
				Daphne of Hillcrest .	..	6 6 22	273	7½	6,615	4·03	266·76	200	304	
Sadler Bros., Noorat	1	1	Ayrshire	Fairlie of Burnbrae ..	4609	13 4.22	196*	27	6.342	4·37	276 90	250	315¾	321. 338
A. H. S. Schier, Kernot	3	2	Ayrshire	Myrtle 2nd of Pine Grove .	4637	7 4.22	273	18	7.513	4 10	307·99	250	351	282, 264, 298
				Marguerite of Glengowrie .	4632	27.4 22	273	20	6.670	4 65	310 12	250	353½	205, 247, 280
O. J. Syme, Macedon	6	6	Friesian	Bolobek Dorothea	Not yet allotted	10 4 22	260	13	4,870	3 80	184·82	175	201¾	
				Domino's Hengerveld Belle ..	307	17.4.22	273	30	11,963	3·60	430·29	250	490½	311, 398, 446. 415
				Bolobek Judith . ..	Not yet allotted	24 4 22	246	22½	8,331	3 38	281 53	175	321	
				Princess Ena ..	299	15 5.22	273	18	9,470	3 41	322·99	250	368¼	384, 442, 424, 371
				Bolobek Jean .	320	20.5 22	273	17½	9.539	3 48	331 68	250	378	249, 359, 337, 419
				Bolobek Anabel	317	24 5 22	273	7	9,440	3·87	365 30	250	416½	305, 390, 380
J. R. Telford, Kyabram	1	1	Ayrshire	Daisy of Hyde Park .	6916	7.6 22	273	17	6.232	4·09	255 16	175	290¾	

* Herd withdrawn before full test completed.

STANDARD HERD TEST—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Yields of Butter Fat.
								lbs.	lbs.		lbs.	lbs.	lbs.	
J. H. Thorburn, Woodend North	1	Nil	Ayrshire											
G. Vallance, Bacchus Marsh	1	Nil												
A. L. Walters, Little River	1	1	Jersey ..	Flower 14th of Melrose ..	Not yet allotted	14.5.22	273	15½	6,099	5·84	356·40	200	406¼	334
Warrnambool High School, Warrnambool	2	Nil	Ayrshire											
H. L. Webb, Sunbury	1	1	Ayrshire	Model of Holly Green ..	6953	22.4.22	273	15	7,484	4·11	307·29	175	350¼	
W. Woodmason, Oakleigh	7	5	Jersey ..	Zoe 6th of Melrose	Not yet allotted	7.4.22	273	15	4,785	6·13	293·35	175	334½	
				Lady Elector 2nd of Melrose ..	5548	18.4.22	273	9½	5,144	5·93	305·23	250	348	263, 360, 395, 421, 309, 361
				Waverley Lass 3rd of Melrose	6312	24.4.22	273	16	6,282	6·41	402·61	250	459	269, 350, 395, 392
				Graceful Duchess 10th of Melrose	3646	1.6.22	273	21	8,009	5·82	466·48	250	531¾	283, 337, 446, 440, 448, 353, 338
				Lady Elector 10th of Melrose	Not yet allotted	7.6.22	273	10½	4,092	6·03	246·81	175	281¼	

EXPERIMENTS IN THE STORAGE OF FRUITS.

(By D. B. Adam, B.Agr.Sc., Department of Agriculture.)

(Continued from page 241.)

APPLES.

In the previous article on apple storage in this journal (*April, 1923*), it was decided to consider the causes of loss in cool storage, and examine, as far as possible, the effects of varying cool storage conditions on those causes. Of necessity, some consideration was given to the conditions under which the fruit was grown. So far scald and Jonathan spot have been discussed.

Internal Browning or Breakdown.

The phenomenon of internal breakdown is met with in many varieties of apples, yet it has not received much attention in the literature on the subject of the cool storage of fruits.

The Bureau of Plant Industry in the United States has investigated a similar, if not identical, trouble in stored apples, grown in the Pajaro Valley, California. Stubenrauch[*] found that browning was worse at 32° F. than at 34° F. Ballard, Magness, and Hawkins[†] have recently confirmed this observation, and have made further investigations into the relative importance of different orchard conditions. R. Waters,[‡] under the title of "flesh collapse," has given some account of this trouble in New Zealand.

Two different types of internal browning may be distinguished immediately on the removal of fruit from store:—

(*a*) Where the fruit tissue cells themselves not only become brown, but the cells also become more easily dissociable from one another, which separation takes place on the application of pressure. The apple in part, or as a whole, becomes soft, and the trouble can be noticed without having to slice the fruit—a true breakdown—the "punky" or "sleepy" apple of the practical storeman.

(*b*) Where the tissue cells become brown, but the cells are not so readily dissociable from one another. The apple is quite firm, and the trouble generally cannot be noticed unless the fruit is sliced.

Consider first the type suggested in section (*a*).

It is an obvious fact that some varieties of apples differ markedly both in physical and chemical constitution from others.

Since the keeping qualities of any fruit are dependent on this constitution, it follows that some varieties do not keep as well as others. The Jonathan apple will not, as a rule, store for as long a period as a Yates apple will. Variations of constitution, however, are also found among apples belonging to the same variety. The constitution of an apple may be determined either by inherent or internal factors, such as the age of the tree on which the fruit is grown, the maturity of the fruit when picked, or to external environment, the climatic conditions, the situation of the tree, and soil conditions. Fruit picked off the young trees (other conditions being equal) will not store as well as fruit picked off old trees, nor will fully matured fruit keep sound in store for such a long period as will less mature fruit. Apples grown on hill-sides of slate or sandstone formation will keep better than the same variety grown on relatively rich, moist flats. The differences of keeping quality in each of these instances are almost directly proportional to the extent of development of internal browning. When, for any of

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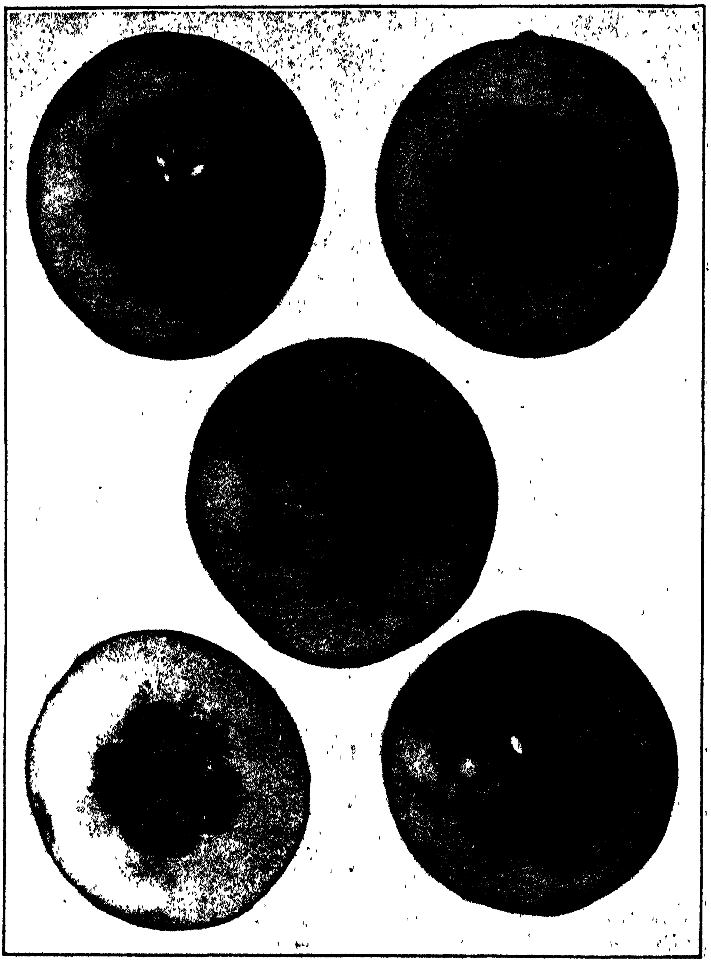
[*] Ice and Refrigeration. Vol. 42, No. 1, pp. 34-36, 1912.

[†] Bull. 1104, Bur. Plant. Ind., U.S.D.A.

[‡] Ice and Cold Storage, Vol. XXV., No 295 p. 241, 1922



Internal Browning of Rymer Apples.

these reasons, an apple is susceptible to internal breakdown, a low storage temperature will tend to aggravate or facilitate its development.

Table VI. hereunder refers to the results of storing Rome Beauty apples for seven months. These apples were grown at Drouin on fairly low, well cultivated, moist, and relatively rich land. The fruit was stored at two different temperatures, and under different systems of refrigeration.

TABLE VI.—ROME BEAUTY APPLES GROWN AT DROUIN, FULLY MATURE; STORAGE PERIOD, SEVEN MONTHS.

Temperature.	Refrigeration System	Internal Breakdown.	Sound.	Breakdown.	Average
				%	%
32° F. ..	Direct expansion and air circulation	21	70	23	19
32° F. ..	Direct expansion ..	14	76	16	
34° F. ..	Direct expansion ..	17	92	14	13
34° F. ..	Air circulation	10	65	13	
34° F. ..	Direct expansion and air circulation	14	99	12	

Similar results in respect to another consignment of Rome Beauty apples are given in Table VII. These apples were also grown at Drouin, were less mature, and of larger grades, 3 inches to 3½ inches; trees situated on a hillside.

The results give the percentages of flesh collapse in each case. In this instance, indeed, as far as possible in all instances, the results for each case are given, so that the reader can himself judge the probable error, which, from the paucity of figures and limited experience, is necessarily large.

TABLE VII.—ROME BEAUTY APPLES FROM DROUIN, LARGE GRADE; STORAGE PERIOD, SEVEN MONTHS.

Temperature.	Internal Browning in Cases					Average
	1.	2.	3.	4.	5	
	%	%	%	%	%	%
32° F.	9·9	5·6	4·8	2·8	2·5	4·3
34° F.	4·0	2·8	..	..	..	3·4
37° F.	1·8	..	..	..	..	0·9

Both these tables indicate confirmation of results obtained elsewhere (Stubenrauch and Ballard, Magness and Hawkins), viz., that 32° F. is too low a temperature for ordinary storage purposes, especially in places where apples, by reason the variety, or its growth conditions, may be susceptible to flesh collapse. 34° F. gives better results than 32° F.; 37° F. is apparently better than either, where the results are gauged by the extent of internal browning in apples stored at these temperatures.

While considering this form of internal breakdown, careful handling, especially with tender varieties, should be remarked upon. The Jonathan apple is a tender variety. Some indirect evidence has been obtained as to the effects of handling; however, its incompleteness and the difficulty of analyzing what constitutes the abstract process called "handling," preclude its useful presentation here. Successful storemen recognise a relation between "sleepiness" and care in handling, bestowing particular attention in preventing the bruising of this variety. The maturer and larger the fruit is, the greater will be the necessity to exercise care in handling.

Although internal breakdown has been divided into two arbitrary sections, this is done rather from the idea of dissimilarity in naked eye appearance than from any theory as to the causes of each condition. In fact, all evidence rather tends to show that in these cool storage troubles a similar cause operates in each instance, and, since it conceivably affects different functions, it would produce different effects.

On somewhat similar grounds apples included in this second section are subdivided into—(*a*) those that show a generalized tissue browning; and (*b*) those that show a localized core browning. The core refers to a star-shaped piece of tissue surrounding the carpels or seed cavities. This core is bounded by a wavy line of demarcation of variable distinctness. It is more or less visible on transecting an apple. There is some evidence to show that this zone is frequently quite distinct, physiologically, from the rest of the apple (Bigelow, Gore, and Howard*).

The Rokewood apple, after long storage, is liable to a general tissue browning, whereas the variety Rymer shows a tendency to core browning; still the occurrence of either type of browning is not definitely a varietal characteristic. Some time after an affected Rokewood is removed from the store, it may become soft. This softness is, however, distinct from the "mealy" softness of apples previously described. The softened apple, while browned, is more springy. The cells themselves as individuals are more or less disturbed, but they are not so readily detachable from one another as is the case with "mealy" apples. Unfortunately, the susceptibility of this variety was not previously known, so that examination and observations were limited to half-a-dozen cases stored at 32° and 34° F. The fruit was stored for seven months. The following general observations may be recorded:—

1. Immediately after the removal of the fruit from store from 80 to 90 per cent. of those stored at 32° F. were found to be affected, the extent of affection varied from very slight to very bad. About 10 per cent. were so badly affected that their condition was evident without slicing.

2. Apples examined at the same time, which were stored at 34° F. showed that about 20 per cent. were affected. None of these were as badly affected as those stored at 32° F.

3. Although apples were stored in chambers with different systems of refrigeration, at each of these temperatures, there was no definite difference in the numbers affected in these chambers.

4. Apples were received which were grown in different situations, though from the same district. From one of these orchards two separate consignments were received, one a fortnight before the other.

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* Bull. 94, Bur of Chem., U.S.D.A.

When stored at 32° F., no definite differences in the numbers affected in any of these lots could be ascertained.

5. After removal from store the numbers that became soft increased. This was especially the case with those stored at 32° F.

Rymers, after a long storage period at 32° F., may show a browning of the core region flesh. An illustration of apples so affected is given.

Unfortunately here, even more so than with the Rokewoods, the opportunities for observation were limited. So much so was this the case that even general remarks cannot be offered as to the relative effects of temperature. After removal from the store, while the discoloration apparently increases in its density, no outward evidence of the condition is noticeable.

The similarity in the appearance of this trouble, and that technically described as "Brown Heart" is worthy of notice. Certainly the conditions under which some of these affected fruits were held were such that the concentration of carbon-dioxide that is believed necessary to produce "brown heart" could not be attained.

Further work on this trouble should, therefore, be of fundamental value to the study of "brown heart".

These very scantly observations, it is hoped, may serve as an index of direction for future work, which work, being at the foundation of the fruit storage problem, will necessarily be productive of much good.

Bitter Pit.

This disease was present in only one of the consignments submitted for experimental purposes, viz.:—Dunn's apples, grown at Tongala. The fruit was picked off trees eight years old, which had not previously borne a crop; the fruit, 2¾-inch grade, was put into store on 15th March, and examined 21st November, and except for bitter pit and some wilting, it was quite sound.

Table VIII. gives the results of an examination of these apples.

TABLE VIII.—BITTER PIT IN DUNN'S APPLES AFTER EIGHT MONTHS' STORAGE.

Chamber	Temperature	Refrigeration System	Number Examined	Pitted	Average
				%	%
1. (a) ..	32° F.	Direct expansion and air circulation	78	8	16
(b) ..			75	21	
(c) ..			75	19	
2. (a) ..	32° F.	Direct expansion ..	105	17	17
(b) ..			83	18	
(c) ..			76	15	
4. (a) ..	34° F.	Air circulation	94	28	26
(b) ..			69	24	

Consideration of these figures show that the disease is more prevalent at 34° F. than it is at 32° F.; this confirms previous experience as to the effects of temperature on the development of pit. The method of estimation and the nature of the disease necessarily give rise to some variations in results, the error of which the reader can estimate himself.

Wilting.

This cool storage trouble is one of variable importance. Conditions in the orchard and in the cool store may both or separately affect its incidence. Some varieties are more susceptible to wilt than others. The variety Scarlet Nonpareil, last year, was easily the worst to wilt in the experimental chambers. Dunn's was another susceptible variety. Many varieties like Granny Smith or Sturmer did not show any wilting after an eight months' storage period.

The maturity of an apple is an important factor in controlling wilt in store; particularly so since the orchardist himself has practically absolute control of the time when the fruit is picked. Immature apples wilt worse than fully mature apples. Fully mature apples wilt slightly worse than do medium mature apples. The maturity of an apple for general purposes is estimated from a consideration of the tone of the green ground colour. A medium mature apple is one which shows a light green colour. While the ambiguity of this term is recognised, it is thought to be the most accurate, yet simple, criterion of maturity for the orchardist. The acquisition of the art of selecting such apples can be gained only by experience.

Of cool storage conditions the temperature is of some importance. Apples wilt worse at 34° F. than at 32° F. This, however, may really rather be the result of differences in relative humidity, which it has been seen is lower at 34° F. than at 32° F. Some preliminary experiments on the loss of weight in apples stored at 32° F. for four months were carried out. These showed losses of from 2.2 per cent. with Stone Pippins to 3.5 per cent.—the extreme with Dunn's apples. These experiments, it is hoped, will be developed in extent.

Losses Caused by External Organisms.

The following fungi have been isolated from apples in store:- *Penicillium glaucum* Link, *Penicillium* sp., *Venturia inaequalis* (Cke), Aderh., *Sclerotinia fructigena* (Pers.) Schr., *Gloesporium* sp., *Cladosporium* sp., *Pleospora* sp., and *Botrytis cinerea* Pers. The *penicilliums* are the commonest fungal causes of loss in apple cool storage.

Botrytis cinerea, which affects the calyx or "eye end" of an apple, may, under favourable conditions for its propagation, become serious. Under such conditions, the fungus develops a dense, white, felt-like mass, the mycelium. Apples in the neighbourhood are infected so that nests of rotten apples may be found. The *Penicilliums* and many storage rot fungi require an injury to the apple before they can develop on it. The main cause of such an injury is bruising. This should be remembered as an important factor in affecting mould development in stored apples.

In studying the relative effects of temperature, it was therefore assumed that any one consignment received uniform treatment in the matter of handling unless there was special notice to the contrary.

Table IX. gives the results of such a study with a consignment of Rome Beauty apples.

TABLE IX.—ROME BEAUTY APPLES FROM DROUIN SHOWING THE RELATIVE DEVELOPMENT OF MOULDS AT DIFFERENT TEMPERATURES, AND UNDER DIFFERENT SYSTEMS OF REFRIGERATION: ONE CASE STORED IN EACH CHAMBER FOR SEVEN MONTHS.

Chamber No.	Temperature	Refrigeration System.	Mould.	Average.
			%	%
1	32° F.	Direct expansion and air circulation..	6	9
2	32° F.	Direct expansion	12	
26	32° F.	Air circulation	10	
3	34° F.	Direct expansion	8	13
4	34° F.	Air circulation	12	
5	34° F.	Direct expansion and air circulation..	18	
6	37° F.	Direct expansion and air circulation..	30	23
7	37° F.	Direct expansion	18	
8	37° F.	Air circulation	22	

From this table an increase in mould development with temperature increase can be noted.

An opportunity to study the importance of wrapping fruit in a condition susceptible to mould losses was afforded by the receipt of some fully mature Dunn's apples from Beechworth. Three cases of these apples were received and stored at 32° F. One case had every layer wrapped, another alternate layers, and in the third no fruit was wrapped at all.

Table X gives the results of examining this fruit:—

TABLE X.—DUNN'S APPLES FROM BEECHWORTH STORED FOR SIX AND A HALF MONTHS AT 32° F.

Treatment.	Mould.	Sound	Sound.
			%
Wrapped	0	131	100
Alternate wrapped	7	116	94
Unwrapped	21	93	82

This table demonstrates the value of wrapping fruit for long storage, where, for any reason, the fruit is susceptible to losses from mould decay.

The value of wrapping pears has been mentioned in a previous article. The difference between apples and pears in their resistance to the inroads of moulds seems rather to be one of degree than one of kind. This resistance is closely correlated with their respective capacities to withstand mechanical injuries during handling.

The tender Jonathan apple is as susceptible to mould losses as some of the harder pears, when handled and stored under similar conditions. Some apples when picked at the right time are so hard that the ordinary, even the rough handling which fruit in practice frequently receives, does not materially affect their keeping qualities. With such varieties, wrapping alternate layers will give satisfactory results. Sturmers, Stone Pippins, Granny Smith, and Rymer are some varieties which may be packed like this.

Finally, it is interesting to notice that the fungus *Venturia inaequalis*, the cause of Black Spot, will grow and produce conidia on the apple surface at 32° F.

NOTES ON THE KEEPING QUALITIES OF SEVERAL VARIETIES.

It should be remembered that these remarks refer in many instances to one consignment from one district, and only to the past season's fruit. Most of the fruit was put into store, either at the end of March, in April, or the beginning of May.

Buncombe.—A well-coloured firm variety, which stores well till August-September. By this latter time, brown scald-like streaks appear; it is this feature that limits its storage life. The flavour after storage is very good, and the flesh is firm and sweet. The loss from mould is small. September 1st is the latest safe date till which this variety should be held.

Cole's Champion.—An attractive looking variety, which, however, does not store well. Flesh collapse is the source of fairly extensive deterioration. The aroma and flavour are both poor. Normally it has not the appearance of a good storage apple. It is necessary to state that these observations were made on one case of fruit, which case was fully mature, picked from young trees. The writer does not think this is nearly as good an apple from the storage stand-point as the Jonathan, which apple it, in some measure, resembles.

Dunn's.—This is a good storage apple. It is very free from skin blemishes resulting from storage. The flavour, sweetness, and firmness of the flesh are each well developed. The advent of mould decay and wilting serve as limiting factors to the storage period. Both these can be regulated to some extent by picking at the correct time, and exercising care in handling. When the apples have acquired a light green colour it is the correct time to pick them. When stored at 32° F., they may be held safely in store for eight months.

Edna May.—This is an excellent storage variety. The apples submitted were grown in Gippsland. It is well coloured, firm, nicely flavoured, and stores in perfect order for seven months. It should be an excellent apple to grow in Gippsland for export purposes.

Granny Smith.—A very sound and excellent keeper. Although the amount of loss caused by mould is small, fruit which has been wrapped is more attractive in appearance after a long period of storage. The fruit is slightly susceptible to scald, which shows up in store about the middle of November. November 1st is the latest safe date that it is advisable to hold this variety.

Jonathan.—This is a medium to good storage apple. While a period of storage has been assigned to the different varieties, it should always be borne in mind that this "life" is dependent on conditions affecting the apple's history previous to storage. This is especially true with the Jonathan. Among the more obvious factors that determine the storage life of the Jonathan apple is its grade. Small grades (2¼ inches) of sound apples were held in good condition till November.

Similar apples of larger grade cannot be successfully held for such long periods. The storage period is governed by the grade. Apples of the 2½-inch grade should not be held longer than six months, the 2¾-inch grade for not longer than four months. These facts indicate the importance of careful grading when packing Jonathans for cool store. The loss, and consequently the storage life of any sample, is determined by the rate of deterioration of the poorest samples. Care in grading has also an economic aspect. Can the man, who has a mixed grade of fruit, where its storage life is determined by the rate of deterioration of the poorest (here the large grade sample) compete with another who has well-graded fruit, and who, therefore, not only has large apples when the former has apples, but also has other smaller apples to sell when his rival has none?

Other conditions, to some extent controllable by the grower, are also important determinants in the cold storage life of apples; maturity and colour may be mentioned here. Though mentioned separately, these two qualities are not entirely independent. Advancing maturity and colour development proceed, to some extent, side by side. The importance of maturity on scald susceptibility, Jonathan spot, and on internal breakdown need not be recapitulated here. Colour, or possibly to express it more correctly, conditions conducive to the development of a good blush, seems, independently of maturity, to have some effect on scald and Jonathan spot development. Pruning to allow the maximum of light to penetrate the trees, and other methods of improving colour production, should be encouraged.

London Pippin.—This apple is a good keeper. If picked when it is a light green colour, it will mellow in store. After long storage the apple is subject to a diffuse surface browning. Apart from this not very serious blemish, the chief cause of deterioration is mould. This variety may safely be stored for seven months. Wrapping alternate layers is sufficient.

Lord Wolseley is a good, firm storage apple. It is peculiar in that the surface of the apples becomes quite sticky. Wrapping alternate layers gives satisfactory results. If picked when full grown, and of light green colour, stores very well till November. This variety, it should be mentioned, is liable to bitter pit, though no apples so affected were found in any samples submitted.

Norfolk Beaupin.—A well-coloured firm apple that keeps well in store for five months. Last season, after this time, it rapidly deteriorated owing to the development of scald. The taste after storage is poor. This apple cannot be recommended for storing.

Rokewood.—A very firm and well-coloured apple. Internal breakdown is the determinant of the storage life of this variety. There is practically no other cause of deterioration. Safe storage seems to be limited to six months. 34° F. is a more satisfactory storage temperature for this variety than is 32° F.

Rome Beauty.—This apple shows remarkable variation in keeping qualities. These variations are dependent on its life history previous to storage. Some Rome Beauty apples of excellent colour and firmness grown at Beechworth kept with practically no deterioration till the end of November. Other Rome Beauty apples from Drouin, stored at practically the same time, while firm, were poor in colour, and reached the end of their "storage life" about July. Another lot of Rome Beauty apples was received from Geelong. These apples were firm, and the colour was medium, well developed; they stored well till the end of October. Some of these apples were grown on grass land, *i.e.*, uncultivated land, apples grown on such land colour better than do those grown on cultivated land.

Rymer.—A fair to medium quality of storage apple. The apple is fair to well coloured, firm, but essentially a culinary apple. The variety is susceptible to scald and internal breakdown, particularly in the core region. With more mature apples the incidence of mould becomes an increasingly important factor in determining losses. August to September is as late as it is advisable to hold this variety. When picking, the grower should not be deceived by the amount of blush, since in some districts a good colour may develop before the fruit is really mature enough to give the best results from storage. The tone of the ground colour of green should be taken as a guide. Wrapping alternate layers gives satisfactory results. A storage temperature of 34° F. is better than 32° F. for this variety.

Scarlet Nonpareil.—This is not a good apple to store on account of its liability to wilt and to Jonathan spot. There is also some loss caused by moulds, but it is free from scald. July is as late as this variety should be stored. If it is stored, wrapping alternate layers is sufficient.

Statesman.—A good storage variety. Firmness and flavour are both well developed on its removal from store. The variety is free from storage skin blemishes. It is limited in storage life by the development of moulds; shows a very slight tendency to wilting. This variety may safely be stored till November. Wrapping alternate layers is sufficient for local storage purposes.

Stone Pippin.—A firm variety which can be stored with safety till September. About November a characteristic form of scald develops on these apples in cool store. This feature limits their "life." Attention should be given to picking at correct maturity, and, if necessary, to other factors influencing scald incidence. Wrapping alternate layers gives satisfactory results.

Sturmer.—A good storage variety; sweetness, and taste are well developed in store. Free from skin blemishes and losses caused by fungi. Shows slight tendency to wilt, particularly if the apples are a little too green when picked. It is safe to store this variety until December.

Winter Majetin.—Only a fair storage variety; it is liable to scald, the onset of which limits its safe "life" in store to July or August. Taste and quality are fair. The loss caused by mould is small. If this variety is stored, special precautions should be taken to prevent scald. Wrapping alternate layers is advisable. It should be stored in a position to get maximum ventilation.

Yappeen.—An attractive looking and excellent keeping variety. Free from skin blemishes, showing no loss after seven months' storage. The taste, however, under all conditions of storage leaves much to be desired.

Yates.—An excellent keeping variety. The firmness, sweetness, and flavour are each well retained and developed. This apple is without doubt the best dessert variety that we grow for long storage purposes. Can be held with practically no deterioration till Christmas time.

GENERAL SUMMARY.

1. Apples to be stored successfully for long periods must fulfil certain conditions in their "pre-storage" life. They must be the correct variety, grown on trees under good conditions, and of suitable age, picked at the right stage of maturity, packed and transported with the necessary degree of care. A modification of any of these conditions affects to varying degrees what might be termed the ideal "storage life" of an apple. Some, though admittedly slight reference has been made to each of these conditions.

2. Of these conditions, possibly the one of picking at the correct maturity is the most important, since it can be controlled almost entirely by the grower himself. Its relation to scald, Jonathan spot, flesh collapse, and to mould development have each been considered.

3. Conditions in the cool store are also important for successful storage. The main conditions are (*a*) temperature; (*b*) system of refrigeration. Of these the more important is temperature. For general storage purposes a temperature of 34° F. is recommended rather than 32° F.; particularly is this the case where large quantities of apples susceptible to internal breakdown are stored. Little, if any, effects on the keeping quality which could be ascribed to the different systems of refrigeration used, was noted.

4. An analysis of the various causes of deterioration of apples in store, and their relation to the varied conditions outlined above has been attempted.

5. Scald seems to be due to undue concentrations of fruit esters about the fruit. Remedies require that this should be removed. To do so, the fruit should be well ventilated or wrapped in ester absorbing oiled wrappers.

6. Jonathan spot development is dependent on (*a*) the variety; (*b*) the maturity at picking time. Scarlet Nonpareils and Jonathans were both badly affected. No cause can be definitely assigned for this trouble.

7. Internal breakdown appears to result from the reaction of a particular inherent constitution, and low temperatures over a certain period.

8. The relative development of bitter pit at two temperatures was found to be proportional to those temperatures. After a six months' storage period greater numbers were found to be affected at 34° F. than at 32° F.

9. Some fungi found growing on apples in cool store at different temperatures have been enumerated. The relative effects of different temperatures, and of modes of packing on mould development have been considered.

10. Wrapping alternate layers gives quite satisfactory results. So far, only variation in mould development can be correlated with this practice; however, in large chambers the better facilities for ventilation may be advantageous.

The wrapping of alternate layers of firm varieties from the keeping stand-point is frequently all that is required.

11. Some remarks have been added on the keeping qualities of the different varieties. An attempt has been made to delineate in each instance the cause of deterioration after a period of storage. The method of studying and eliminating these limiting factors, as far as is possible, is surely a sound way to improve and extend the period over which fruit can be successfully stored.

. . . .

The writer is pleased to take the opportunity here of thanking the orchard supervisors and growers concerned in collecting the fruit and necessary information regarding conditions in the field.

This work, from the very nature of the subject under consideration, can at best only be regarded as a preliminary study, and, should it serve as an indication of the most profitable lines for future investigation on this subject in Victoria, something has been accomplished.

SILO BUILDING AND THE MAKING OF SILAGE.

The following notes on the making of silage and the building of a silo by Mr. John Kerr, of "Olinda Yarra," Yering, are reprinted from *Stock and Land*:—

"I gladly give my experience of ensiling fodder practised here. I might say that on this farm, where 160 cows are being fed and milked, the silo is given precedence over every other system of fodder-conservation, and has been so preferred for over thirty-five years. It is still first favorite as a means of providing the bulk portion of the fodder-continuance necessary to payable dairying operations.

Like your other correspondents, I have wondered why many dairymen, otherwise displaying serious intent to treat their cows properly, have continued so long to overlook it. I know that, should the herd here by any circumstance be deprived of the regular ensilage ingredient in the ration supplied, there would be a considerable diminution in the annual returns. The cows here look to it from the time they can chew, and never during the time since I first adopted the process have they wanted for it, when they needed it most.

For about the first twenty years of my using ensilage, underground pits were employed, and answered every purpose except the convenience of emptying. The overground silo was then adopted, and the two silos (one of brick and the other of concrete) then built have been in bi-annual requisition without a break ever since. Each is of about 120 tons capacity, and a full 480 tons of maize and Algerian oats goes through them every year, at a usual cost of about 10s. a ton for the maize and 15s. for the oats. This cost includes interest on the £200 spent on their original construction.

The practice followed here is to fill with the oat crop about December of each year, to be used immediately, calves, as well as the milch cows, receiving a share. By the end of April the silos are again empty and available for the maize crop.

All crops are chaffed for their better packing, and convenience also of both elevating and extracting. Close packing is necessary to exclusion of air, which latter is all essential. Indeed, I find that the whole secret of good ensilage is summed up in effective expulsion and exclusion of air from the material. What contributes to this contributes to the quality of the output.

To this end—exclusion of air—certain structural features and certain filling practices must be observed. Here are some of these essentials, all, necessarily, within the bounds of economy—

(1) Air-tight non-absorbent walls (brick, concrete, wood or iron).

(2) True cylindrical shape and smooth internal wall surface. (A corner, a bump, a roughness on a contracting diameter impedes settling; concavities in the wall face admit air.)

(3) A depth or height not less than 20 feet. (The main proportion of the silage is thus preserved by the greater pressure from the material itself, leaving only the uppermost few feet to receive special attention.)

(4) A diameter in proportion to the number of animals to be fed. (Once opened, 3 inches of the whole surface must be used daily, or mould will begin to appear, with consequent spoiling.)

(5) The chaffing of the material being ensiled. (To cause closer packing and to obviate the heavy labour of tearing unchaffed contents asunder when extricating.)

(6) The effective mixing of the heavier and lighter material, which invariably become segregated in their descent. (If flag or leaf is allowed to accumulate in one quarter near the wall, admission of air and consequent mould invariably occurs. Preferably this light material should be kept toward the centre.)

(7) Filling fast enough to protect from air-exposure as soon as possible. (Air not only favours decomposing mould growth, but also causes excessive oxidation—combustion —which will go on to the point of charring at least, if not corrected by continuance of filling.)

(8) Suitability of crop. (Some crops are too "squashy," such as rape.)

(9) The right stage of ripeness. (If cut too green, even such suitable crops as maize and oats come out too sour, and perhaps "squashy" also, unless toned down with dry oaten or other chaff. If cut too ripe, the lightness makes exclusion of air impossible, and a dark, charred product results.)

Personally, from my own acquired knowledge, I can confidently recommend the following to any one desirous of the better feeding of their stock, viz.:—

A silo of machine-made bricks, laid in cement; 9-inch walls for half the height and then 4-inch for the remainder, with a reinforced flange on top 9 inches wide (on which to rest weighing material, to be referred to later). The first 14 feet to be reinforced, during building, with two encircling black No. 8 wires on every row of bricks, and the 4-inch brickwork with one similar wire on every row. Make the silo not more than 2 feet underground and 28 feet above (30 feet deep in all). Diameter to be according to number of cows (not more than 10 feet for 20 cows and 20 feet for any number over 80). Diameter not to vary a fraction of an inch at any spot. Finish off internally with 2 to 1 cement plaster and a straight edge carefully applied from top to bottom. Introduce the only port hole (2 ft. 6 in. x 1 ft. 6 in.) at ground level, to be used with an internal shoot of movable transverse boards from top to bottom.

Ensile Algerian oats, or cereals and legumes (mixed) at the milky stage of the grain. Maize, however, is the best ensiling crop of all. Cut when the grain has attained full size and begins to dent. Thoroughly mix and distribute the stuff oneself all the time the cutter is working, not trusting it to the hired man out of sight under conditions which make sitting down more comfortable. All through the filling keep the portion of the surface that is against the wall as high as practicable in advance of the centre. For the bottom third of the silo even 2 feet a day is a safe and proper rate of filling. The rate should then be gradually increased, until, near the top, as much as 10 feet a day may be put in, with advantage. At this stage settling occurs much faster, and all hands must keep hard at it to save what would otherwise spoil.

Trampling, especially around the wall, now becomes advisable, to save the top, which, unlike the lower, lacks overburden to protect it from air admission.

To fill a silo completely the material must be carried several feet above the walls to allow for settling. The best method of containing this for the short time until it subsides is to stack 3 feet of loose bricks around the top of the wall as reasonably smooth and plumb inside as possible. (If carefully laid they will hold up to 3 feet quite securely.) When settling becomes so slow as to make further filling not worth while, weighting and sealing may be undertaken. And here the bricks again serve.

For sealing use plain galvanized or black iron sheets that have been tarred. Cut enough outer ones so that they fit closely the concavity of the circular internal wall right around. (The remainder do not need cutting.) Give each sheet an overlap of at least 6 inches over its fellow, and lay them all as flat as possible over the whole area of the surface. If the ensilage is to stand long before use, several inches of air-excluding material, such as soil, should be added, and then the bricks; but if not to stand long, an inch or two of soil and the bricks will serve. If feeding is to start very soon, soil is not worth while. Then use just the iron sheets and the bricks, always laying the latter close together. When about to open the silos, the bricks should be again stacked carefully, in readiness for the next filling.

In conclusion, I would stress the principle of the ensiling process, viz., air exclusion."

The Report on the Egg-laying Competition which ended on 31st March last will be printed in the July *Journal*.

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WATER REQUIREMENTS OF FARM CROPS.

(Continued from page 339.)

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

APPLICATION OF RESULTS TO WHEAT BELT.

We have seen that the water requirement of wheat varies with the season and with the locality in which it is grown, and that a fairly close relationship exists between the water requirement and the rate of evaporation—especially the rate of evaporation during the period of maximum transpiration.

The average water requirement for winter grown wheat at Werribee under field conditions during the drought year of 1914 was 409.5. The average water requirement for wheat under field conditions at Rutherglen during two years (a normal year and a drought year) was 395.

The average water requirement of wheat at Rutherglen in the Pot Culture House for four seasons was 380. Averaging these values, we get an average Transpiration Ratio for dry matter and grain of 395 and 1,067 respectively, as is shown in the following table:—

TABLE XXV.

SHOWING AVERAGE WATER REQUIREMENT OF WHEAT UNDER VICTORIAN CONDITIONS.

	Dry Matter.	Grain.
1. Werribee (1914) (Field Conditions) ...	409.5	1,039
2. Rutherglen (1914-1915) (Field Conditions)	394	1,074
3. Rutherglen (1915-1919) (Pot Culture House)	380	1,088
Average	395	1,067

We may assume, therefore, that over an average of seasons these values fairly represent the Transpiration Ratios for dry matter and grain for wheat for climatic conditions such as obtain at Rutherglen. The actual value in any one season will, of course, vary with the intensity of the physical environmental factors.

These values are higher than those recorded by Lawes and Gilbert in England, and Hellriegel in Germany, but on the other hand they are much lower than the ratios recorded by Briggs and Shantz in the United States and Leather in India.

Let us see what these values imply, and what limits they impose on wheat production in Australia.

A Transpiration Ratio of 395 means that 395 tons of water must pass through the crop to produce 1 ton of dry matter. A crop of wheat weighing 1 ton (grain and straw) will usually produce about 13 bushels of grain. In these tests the production of 1 ton of grain requires the passage of 1,067 tons of water through the crop.

This quantity of water is equivalent in weight to 10.53 inches of rain over 1 acre. Hence if 10.53 inches of rain must be transpired by a wheat crop to produce 1 ton of grain, each inch of rain passing through the crop should produce, on an average, 3.54 bushels of wheat. In other words, in an average season, for moderate rainfalls, each inch of rain transpired by the crop is capable of producing a yield of 3.54 bushels per acre.

Let us see what yields, expressed in terms of rainfall, are actually obtained in the wheat belt of Australia. It is a well recognised fact that rainfall is the limiting factor to wheat production in the Australian wheat belt. In Victoria and South Australia, approximately 75 per cent of the total yearly rainfall is received from April to October, which coincides approximately with the growing period of the wheat crop. In the drier districts of South Australia and Victoria wheat ripens towards the end of November. Rains in November are usually very light, and have only a slight effect on the wheat yield. Heavy rains during September have the most pronounced effect on yields, for the wheat is then approaching its period of maximum transpirational activity, and shortages of soil moisture at this stage greatly depress yields.

The normal seeding season for wheat extends from the middle of April to the end of May. In some districts, *e.g.*, northern areas of South Australia and Victorian Mallee, earlier sowing is practised; whilst in other districts, and notably on the black clay loams of the Wimmera, seeding is much later.

Under normal conditions, the Antarctic rains, which govern wheat production in Southern Australia, begin in April and end in October. Any rain that falls in April is readily held by the soil and is available for the young crop sown later. Rains in November, however, are of little use to the wheat crop except in late districts and in abnormally cool seasons.

For the State as a whole the average rainfall during the growing period of the crop may be considered as practically equivalent to the rain fall for April to October inclusive. We may call this the *seasonal* rainfall.

In a previous publication the writer pointed out that a close relationship existed between the average wheat yield of Victoria and the composite rainfall for May-October inclusive, and that over a period of 25 years an average yield of 1 bushel of wheat was obtained for each inch of rain during that period. A somewhat similar relationship holds true for South Australia.

In order to determine the relationship between wheat yields and the composite seasonal rainfall (April to October) in Victoria and South Australia, the average wheat yield of the State in bushels per acre was compared with the composite seasonal rainfall in inches for representative wheat-growing centres. Ten centres were selected for Victoria, viz.: Mildura, Ultima, Beulah, for the Mallee; Nhill, Horsham, Donald, for the Wimmera; Shepparton, Bendigo, and Echuca for the Northern areas, and Rokewood for the Western District. The Mallee, Wimmera, and Northern areas each produce on an average of years about 30 per cent. of the total wheat yield of the State, whilst the Western and Central districts produce the remaining 10 per cent.

The composite average seasonal rainfall at these ten representative wheat-growing centres may be taken as equivalent to the average seasonal rainfall for the wheat belt of Victoria.

The wheat belt of South Australia covers a much wider area of country than Victoria, though the acreage sown is slightly less. In order to obtain the composite average seasonal rainfall for South Australia, twenty centres were selected. The centres were chosen from districts in proportion to the aggregate wheat production of the districts for a period of ten years. The centres selected were Loxton, Blanchetown, Eudunda, Maitland, Mallala, Saddleworth, Snowtown, Paskeville, Redhill, Balaklava, Yacka, Gladstone, Crystal Brook, Orroroo, Wilmington, Border Town, Coonalpyn, Cowell, Streaky Bay, and Fowler's Bay. The accompanying graph (Fig. 26) shows the variations in the average yield of wheat and the composite rainfall during the crop growing period for three decades for South Australia.

From 1891 until 1910 the line representing the average yield of wheat for South Australia in bushels per acre was considerably below the line representing the composite average seasonal rainfall expressed in inches of rain. The two graphs representing rainfall and wheat yield show on the whole a gradual convergence from 1891 to 1910. From 1911 to 1921, with the exception of the drought year 1914, the two lines almost coincided, and in 1911, 1912, 1916, 1918, and 1920 the graph representing the average wheat yield in bushels per acre was slightly above the graphs representing composite average seasonal rainfall in inches. These were the years when the average wheat yield in bushels per acre slightly exceeded the seasonal rainfall expressed in inches, *i.e.*, when the wheat growers as a whole reaped more than a bushel of wheat for each inch of seasonal rainfall.

Throughout the whole period of thirty years the South Australian wheat growers reaped .71 bushels of wheat for each inch of winter rainfall received.

Let us now compare the ratio of wheat yield to winter rainfall for three periods of ten years. Such a comparison will show the extent to which the wheat growers as a whole have progressed towards the more effective utilization of soil moisture.

The average wheat yields of South Australia, the composite seasonal rainfall, and the ratio of wheat yield to rainfall for the past three decades are summarized in Table XXVI.

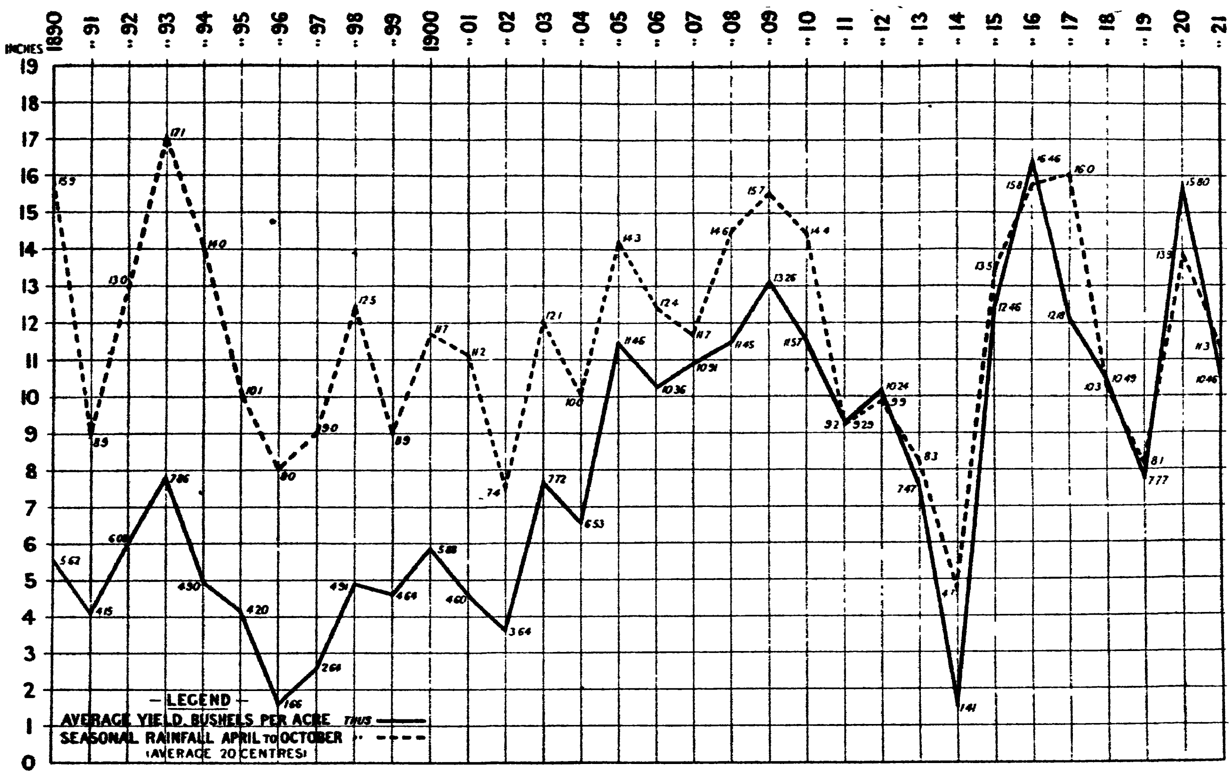


Fig. 26.—Graph showing relationship between Average Wheat Yield and Seasonal Rainfall in South Australia, 1890–1921.

TABLE XXVI.

SHOWING FOR DECENNIAL PERIODS THE AVERAGE WHEAT YIELD IN BUSHELS PER ACRE, COMPOSITE SEASONAL RAINFALL IN INCHES, AND RATIO WHEAT YIELD TO RAINFALL, FOR SOUTH AUSTRALIA, 1892-1921.

Decennial Period.	Average Wheat Yield of State.	Composite Seasonal Rainfall.	Ratio Wheat Yield. / Rainfall.
	Bushels per acre.	Inches.	Bushels per acre of rain.
1892–1901 . . .	4·73	11·55	·41
1902–1911	9·62	12·18	·79
1912–1921	10·47	11·18	·94
Average for 30 years ..	8·27	11·64	·71

The average rainfall for each decade is fairly uniform, but the wheat yield has shown considerable improvement. The ratio wheat yield to rainfall has shown a steady increase, from an average of .41, for the first decade, to .94 for the last decade, with an averge of .71 for the whole period. If 1 inch of rain is capable of producing 3.54 bushels of wheat, it is quite apparent that the wheat growers of South Australia, as a whole, have obtained only about one-quarter of the possible maximum yield during the last decade.

The position is much the same with the Victorian wheat growers. The accompanying graph (Fig. 27) shows the fluctuations in the wheat yield and the composite seasonal rainfall (April to October, inclusive) for a period of 30 years.

From 1892 to 1907 the line representing composite seasonal rainfall in inches was above the line representing the average wheat yield of the State in bushels per acre, though the two graphs show, as before, a gradual convergence. From 1908 to 1921 the line representing the wheat yield was above the line of seasonal rainfall in nine years out of fourteen. These where the years when Victorian wheat growers reaped more than a bushel of wheat for each inch of rain.

If we now compare the average seasonal rainfall with the average wheat yields over decennial periods, we arrive at the following position :—

TABLE XXVII.

SHOWING FOR DECENNIAL PERIODS THE AVERAGE WHEAT YIELD IN BUSHELS PER ACRE, COMPOSITE SEASONAL RAINFALL IN INCHES, AND RATIO WHEAT YIELD TO RAINFALL FOR VICTORIA, 1892-1921.

Decennial Period.	Average Wheat Yield of State.	Composite Seasonal Rainfall.	Ratio Wheat Yield. / Rainfall.
	Bushels.	Inches.	
1892–1901	7·65	11·49	·67
1902–1911	10·50	11·63	·90
1912–1921	12·62	11·59	1·09
Average for 30 years ..	10·26	11·59	·89

The composite seasonal rainfall for Victoria is practically the same as South Australia, but the wheat yields are uniformly higher. The ratio wheat yield to rainfall shows a steady increase from .67, in the

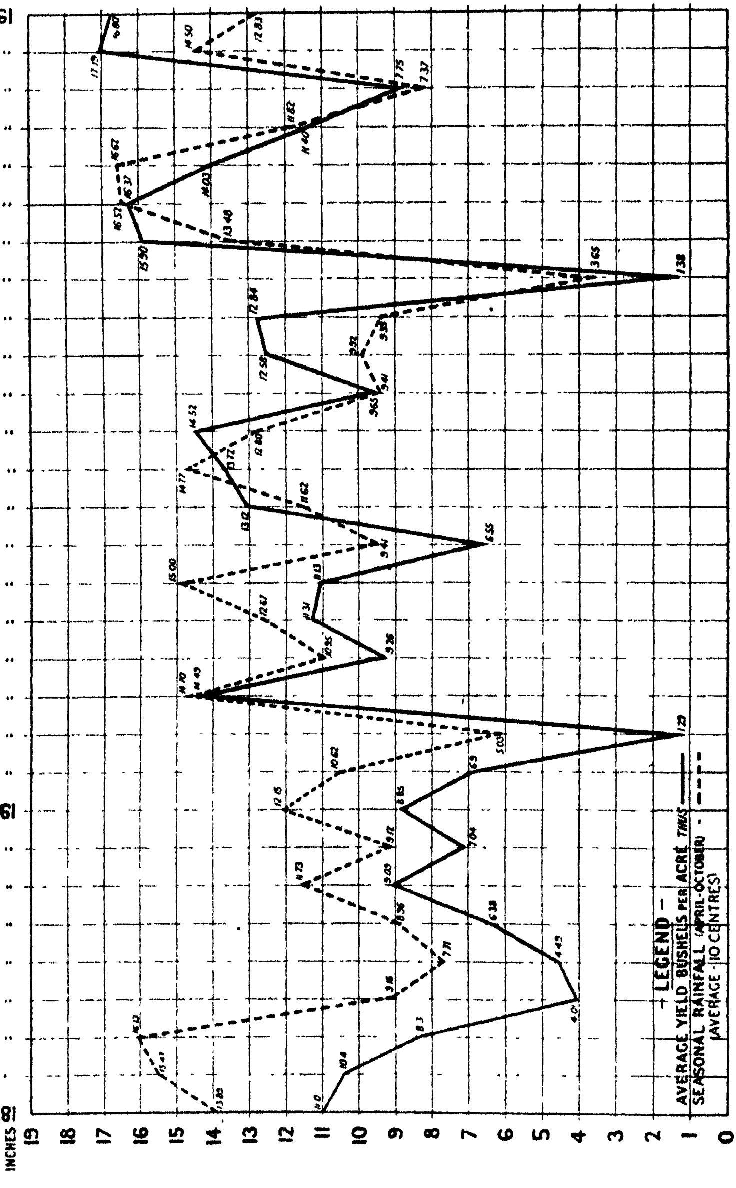


Fig. 27.—Graph showing relationship between Average Wheat Yield and Seasonal Rainfall in Victoria, 1892–1921.

first decade, to 1.09 for the last decade, with an average value of .89 for the whole period of 30 years. ✓

Though the Victorian wheat grower has markedly increased in efficiency during the past decade, the average yield obtained for each inch of rain is only 1·09 bushels; less than a third of the possible maximum.

The average wheat yield of Victoria has shown a consistent improvement notwithstanding the fact that during the past two decades several million acres of relatively poor land in the dry Mallee areas have been won for settlement. In these newer Mallee areas, which form a considerable portion of the wheat belt, wheat growers have not yet been able to completely abandon pioneering methods, which, in the Mallee, always result in low average yields.

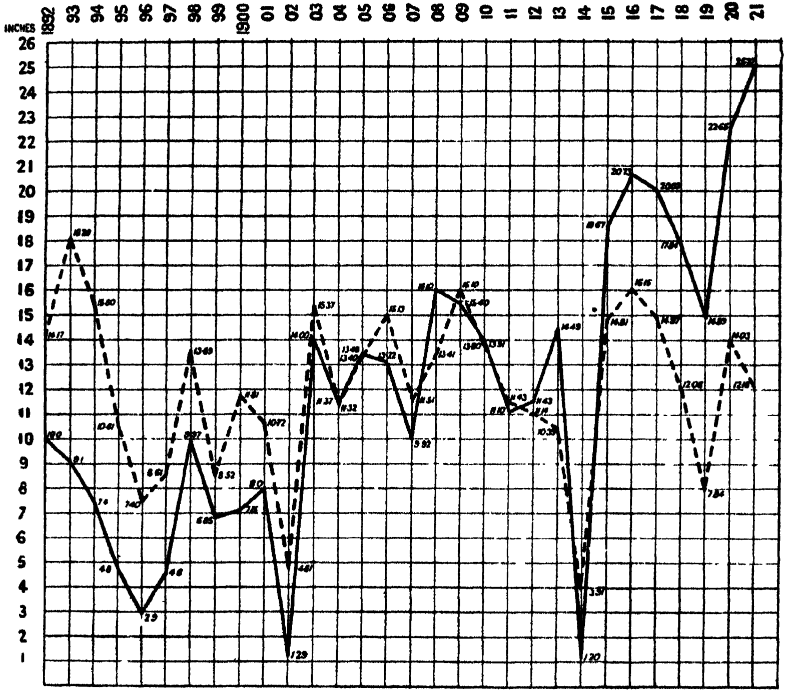


Fig. 28.—Graph showing relationship between Average Wheat Yield and Seasonal Rainfall in the Wimmera, Victoria, 1892–1921.

Average Yield in bushels per acre thus ————

Seasonal Rainfall (April–October) thus — — — —

Advanced methods of wheat farming cannot be applied to these Mallee areas until the Mallee roots and shoots are completely eliminated from the soil, a process which takes from seven to ten years under the prevailing method of treatment.

The average wheat yield of the State, therefore cannot yet be regarded as representing the normal wheat production for Victoria. If we study the relationship between wheat yield and seasonal rainfall in an old-settled district of moderate rainfall, *e.g.*, the Wimmera, we find that the yield of wheat, expressed in terms of inches of seasonal rainfall, is much higher than the average of the State. The accompanying graph (Fig. 28) shows the relationship between seasonal rainfall and crop yield for the Wimmera District, in which approximately 600,000 acres of wheat are sown annually.

The same general relationship between the graph of rainfall and crop yield holds for the Wimmera as for Victoria and South Australia.

From 1892 to 1903 the rainfall graph was consistently above the graph representing wheat yield, but the two graphs show a gradual convergence. From 1903 till the drought of 1914 the graphs follow one another very closely. From 1915 to 1921 the graphs show increasing divergence, indicating that the ratio wheat yield to rainfall is gradually increasing.

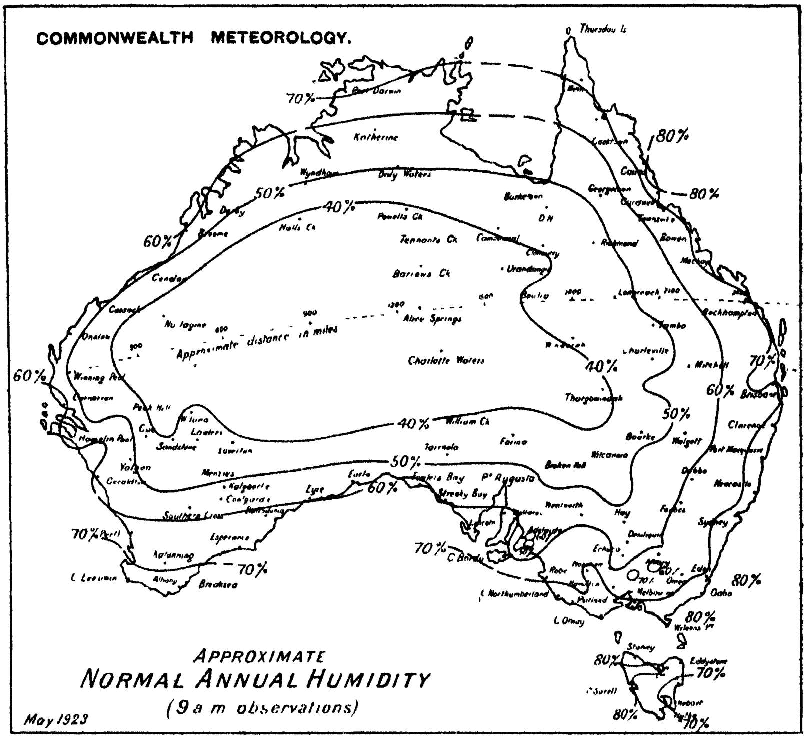


Fig. 29.—Map of Australia showing lines of equal annual humidity.
The greater portion of the Wheat Belt of Australia has an average humidity of from 60% to 70%.

These relationships for each year are summarized in the table XXVIII. The average rainfall for each decade is approximately the same, though the last decade, 1912-21, shows slightly lower averages than the previous two decades. Moreover, the average rainfall for the Wimmera over the whole period, and for each decade, agrees very closely with the composite average rainfall of both South Australia and Victoria.

During the first decade the average ratio wheat yield to rainfall for the Wimmera was .59, whereas for Victoria it was .67. During the last decade, however, the ratio wheat yield to rainfall increased to 1.43 for the Wimmera, whereas for Victoria the ratio was only 1.09

Table XXVIII

Showing Average Wheat Yield and Composite Seasonal Rainfall, and Ratio Wheat Yield to Rainfall for Wimmera District, Victoria, for 30 Years.

Year.	1892–1901.			Year.	1902–1911.			Year.	1912–1921.		
	Wheat Yield.	Seasonal Rainfall.	Wheat Yield / Rainfall.		Wheat Yield.	Seasonal Rainfall	Wheat Yield / Rainfall.		Wheat Yield.	Seasonal Rainfall.	Wheat Yield. / Rainfall.
	Bush. per acre	Inches.	Bush. per inch		Bush. per acre	Inches.	Bush. per inch		Bush. per acre	Inches.	Bush. per inch
1892	10·0	14·17	·71	1902	1·29	4·81	·26	1912 .. .	11·43	11·14	1·03
1893	9·1	18·20	·50	1903	14·00	15·37	·91	1913 . ..	14·49	10·34	1·41
1894	7·4	15·5	·48	1904	11·37	11·32	1·00	1914 .. .	1·20	3·91	·31
1895	4·8	10·61	·45	1905 ..	13·48	13·40	1·00	1915 ..	18·67	14·81	1·26
1896 ..	2·9	7·40	·39	1906 .. .	13·22	15·13	·87	1916 . .	20·73	16·16	1·28
1897	4·6	8·61	·54	1907	9·92	11·51	·86	1917 .. .	20·03	14·97	1·34
1898	9·97	13·69	·73	1908	16·10	13·41	1·20	1918 ..	17·84	12·04	1·48
1899	6·85	8·52	·80	1909	15·40	16·10	·96	1919 .. .	14·89	7·84	1·90
1900 .. .	7·15	11·81	·60	1910 . ..	13·91	13·80	1·01	1920	22·65	14·03	1·61
1901	8·0	10·72	·75	1911	11·10	9·26	1·20	1921 .. .	25·27	12·18	2·07
Average 10 years	7·08	11·93	·59	Average 10 years	11·79	12·41	·95	Average 10 years	16·72	11·74	1·43

During the first decade the highest ratio for the Wimmera was obtained in 1899, when .8 of a bushel of wheat was reaped per inch of rain. During the second decade 1.2 bushels were reaped in 1908 and 1911 for an inch of rain. During the last decade a yield of 2.07 bushels per inch of rain was obtained during 1921.

Omitting the drought year, 1914, during which only 3.9 inches of rain fell in seven months, the average ratio for the nine remaining years of the past decade was 1.66 bushels per inch of rain—approximately half the possible yield, assuming all the seasonal rainfall was transpired by the crop, and none lost by evaporation from the soil.

Marked developments in wheat-growing methods in the Wimmera have taken place during the past two decades. The first advance was brought about by the introduction and general use of superphosphate. Comparatively few wheat growers used superphosphate with their crop in 1900. By 1910 the use of superphosphate became general in the Wimmera. The next improvement was the introduction of Federation wheat—a creation of Farrer's—a short-strawed, spare-stooling wheat, with marked drought-resisting powers, and possessing a high migration ratio, *i.e.*, a high proportion of grain to straw. This variety proved of exceptional value for Wimmera conditions, and now it is grown on nearly every Wimmera farm.

The discovery of the value of summer fallowing, and the thorough working of the fallows, resulted in a considerable increase in crop yield. To-day practically 100 per cent. of the Wimmera wheat crop is sown on fallow land.

Two further developments occurred during the past decade, which promise to augment the wheat yields—heavy manuring and late seeding. The value of liberal manuring was brought out by the establishment by the Department of Agriculture of permanent manurial tests in 1911 at the Longerenong Agricultural College, situated in the heart of the Wimmera. On these plots it was shown that for the past eleven years, dressings of superphosphate up to 2 cwt. per acre were much more profitable than the dressings then in vogue in the district, viz., from 56 lbs. to 60 lbs. per acre.

The results of the permanent manurial plots at Longerenong for the past eleven seasons are summarized in Table XXIX.

TABLE XXIX.

INFLUENCE OF VARYING FERTILIZERS ON THE YIELD OF WHEAT GROWN ON THE PERMANENT MANURIAL PLOTS, LONGERENONG. AVERAGE OF ELEVEN YEARS, 1912-1922.

Treatment of Plot.	Yield per acre.	Increase over Unmanured Plot.
	Bushels.	Bushels.
No Manure	29·7	..
Super ½ cwt...	33·9	4·2
Super 1 cwt...	35·1	5·4
Super 2 cwt.	37·2	7·5
Super 1 cwt + Lime 5 cwt.	35·0	5·3
Super 1 cwt. + NaNo$_3$ 40 lbs. (with seed) ..	34·4	4·7
Super ½ cwt. + Basic Slag ½ cwt.	35·0	5·3
Basic Slag 1 cwt.	32·0	2·3

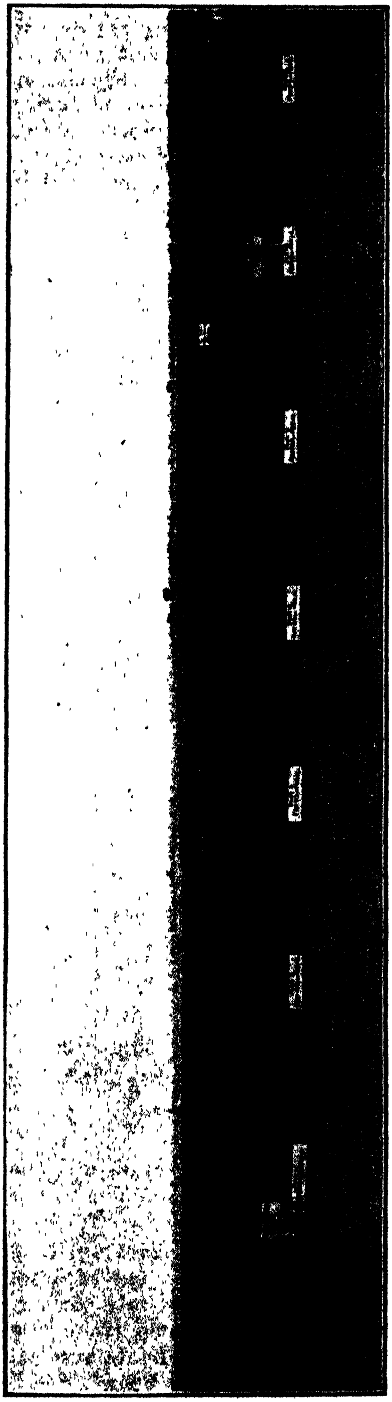


Fig. 30.—View of Rate of Seeding and Early and Late Sowing Tests, Longerenong Agricultural College.

These results show that superphosphate is more effective as a fertilizer than basic slag. Lime applied at the rate of 5 cwt. per acre does not result in any increase over the corresponding control plot. The soil on which the tests were conducted were typical of the Wimmera plains, and contained a sufficiency of carbonate of lime. With respect to superphosphate, the heaviest dressing (2 cwt.) gives the greatest and most profitable increase in yield.

The average yield per acre from the 2 cwt. dressing is 3:3 bushels greater than from the light dressing (56 lbs.), which was the average quantity of fertilizer used in the Wimmera District when the investigations were begun.

Nitrate of soda applied with the seed did not produce any increase in yield.

It was shown by monthly analyses of the soil through a series of years that careful fallowing of the black clay loams of the Wimmera enabled 91.9 lbs. of nitrate nitrogen, equivalent to 5 cwt. of nitrate of soda, to be made available at seed time as a result of the action of the nitrifying bacteria during the summer months. Under these circumstances, heavy dressings of phosphate in the presence of an abundance of nitrate nitrogen and free carbonate of lime, supplemented by much conserved soil moisture, have enabled heavy wheat crops to be obtained on a moderate seasonal rainfall.

Finally, the adoption of late seeding has led to increased yields in the Wimmera. This practice not only permits the more complete extermination of weeds—competitors for the limited soil moisture—but also increases the proportion of grain to total dry matter produced.

The value of late sowing, as compared with early sowing on the black clay loams of the Wimmera, is strikingly illustrated by the experiments conducted for the past seven years by the Department of Agriculture at the Longerenong Agricultural College. Six varieties of wheat, two early maturing, two mid-season, and two late maturing types, were sown during the normal seeding period for Victoria (May), and the same six varieties were sown at a time that would be regarded as very late, *i.e.*, July. The results of these tests are summarized in Table XXX.

TABLE XXX.

SHOWING RESULTS OF EARLY AND LATE SOWING OF SIX VARIETIES OF WHEAT ON BLACK WIMMERA SOIL, LONGERENONG AGRICULTURAL COLLEGE, SEASONS 1916-1922.

Variety.	1916.	1917.	1918.	1919.	1920.	1921.	1922.	Average for seven years.
Early-sown Plots.	bush.	bush.	bush.	bush.	bush.	bush.	bush.	bush.
King's Early	28·6	37·8	32·0	24·1	32·9	28·3	19·3	29·0
Bunyip	18·6	38·4	28·1	20·6	26·0	26·6	19·4	25·4
Federation	29·9	48·2	42·2	32·1	28·3	47·0	39·0	38·1
Yandilla King	32·9	36·5	32·5	28·3	36·6	39·6	36·6	34·7
Marshall's No. 3 ..	29·9	38·4	34·6	10·6	32·0	36·0	33·6	30·8
Dart's Imperial ..	27·1	39·7	30·3	23·0	20·6	42·0	35·2	31·2
Average of Early-sown Plots	27·8	39·8	33·2	23·1	29·4	36·5	30·5	31·5
Late-sown Plots.								
King's Early	7·4*	41·6	39·0	26·9	40·0	46·6	36·0	33·9
Bunyip	20·1	39·3	30·7	22·6	38·6	44·6	34·7	33·0
Federation	42·7	43·9	44·2	24·0	48·6	42·9	43·4	42·8
Yandilla King	32·5	41·6	31·4	20·8	51·3	49·6	41·8	38·5
Marshall's No. 3 ..	25·6	38·4	37·0	22·0	42·0	42·0	35·5	34·6
Dart's Imperial ..	30·5	37·0	37·4	22·3	38·0	44·0	36·8	35·2
Average of Late-sown Plots	26·4	40·3	36·6	23·1	43·0	44·9	38·0	36·3

* Crop lodged and shelled badly on account of heavy December rain

These results demonstrate the value of late sowing for all the varieties tested.

The average yield of the late-sown plots for the seven years was 36.3 bushels per acre as compared with 31.5 bushels for the same varieties sown early; *i.e.*, an increase of 15.2 per cent. in favour of late sowing. The varieties differ considerably in the relative order of yield from year to year, but on the whole, Federation, both for early and late sowing, has given uniformly higher yields than any of the varieties tested.

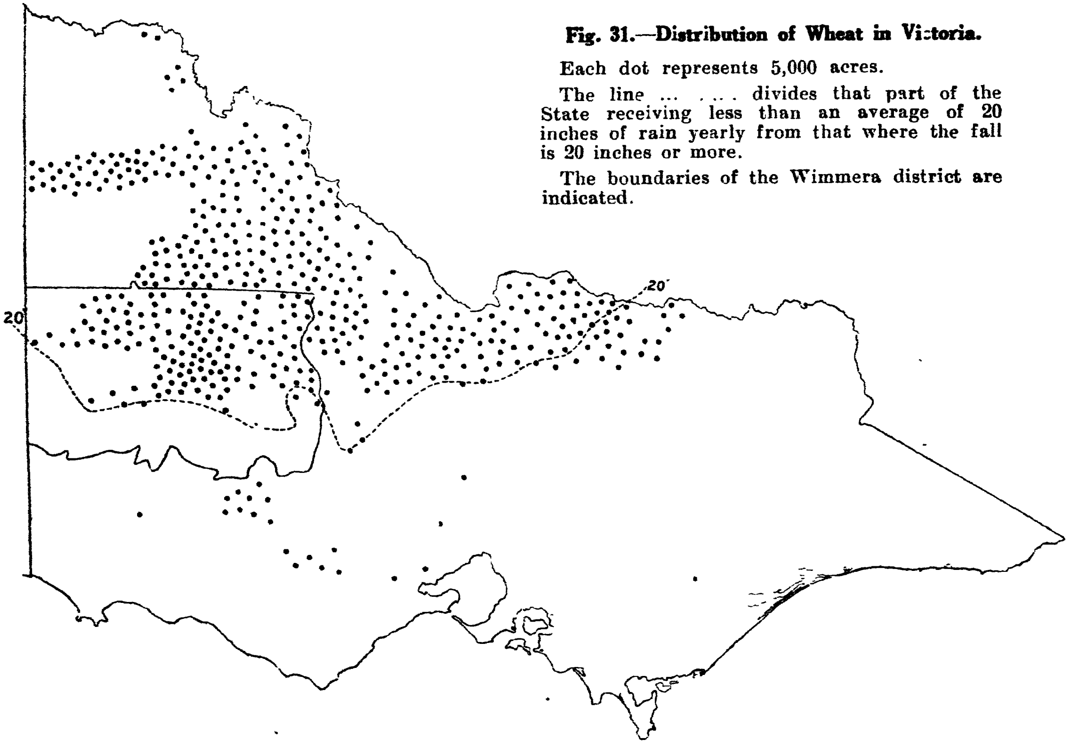


Fig. 31.—Distribution of Wheat in Victoria.

Each dot represents 5,000 acres.

The line ... . divides that part of the State receiving less than an average of 20 inches of rain yearly from that where the fall is 20 inches or more.

The boundaries of the Wimmera district are indicated.

On the whole, late sowing has been found advantageous in normal and wet years, whilst in dry seasons the advantages from late sowing are not noticeable.

The effect of early and late sowing is very pronounced on the general development of the plant, and in particular on the relative proportion of grain to total dry matter. Early sowing on the Wimmera soils produces a tall, leafy crop, with a relatively low percentage of grain to total dry matter.

Late sowing, on the other hand, produces shorter crops, with a higher percentage of grain to total dry matter. The percentage of grain to total dry matter for these plots, and for a rate of seeding test with Federation wheat, was determined for the 1922 season. The results are summarized in Table XXXI.

TABLE XXXI.

EFFECT OF EARLY AND LATE SOWING ON THE PERCENTAGE OF GRAIN TO TOTAL CROP, WITH SIX VARIETIES OF WHEAT, AND WITH FEDERATION WHEAT SOWN AT VARYING RATES OF SEEDING.—LONGERENONG AGRICULTURAL COLLEGE, 1922.

Variety.	Percentage of Grain to Total Crop.	
	Early Sowing.	Late Sowing.
	per cent.	per cent.
King's Early	25·0	30·1
Bunyip	25·7	29·0
Federation	27·9	33·3
Yandilla King ..	24·2	35·8
Marshall's No. 3	24·4	30·3
Dart's Imperial	22·0	26·3
Average ..	24·8	30·8
Federation—		
45 lbs. per acre	23·2	29·2
60 lbs. per acre	27·8	32·8
75 lbs. per acre	28·9	33·8
90 lbs. per acre	27·5	28·9
120 lbs. per acre	24·3	35·7
	26·3	32·1

With each variety the proportion of grain to total crop with late seeding was considerably greater than with the same varieties sown early. The same differences were observed with Federation wheat sown at rates varying from 45 lbs. to 120 lbs. of seed per acre.

Similar results were obtained at the State Research Farm, Werribee, during the past season. The results are summarized in Table XXXII.

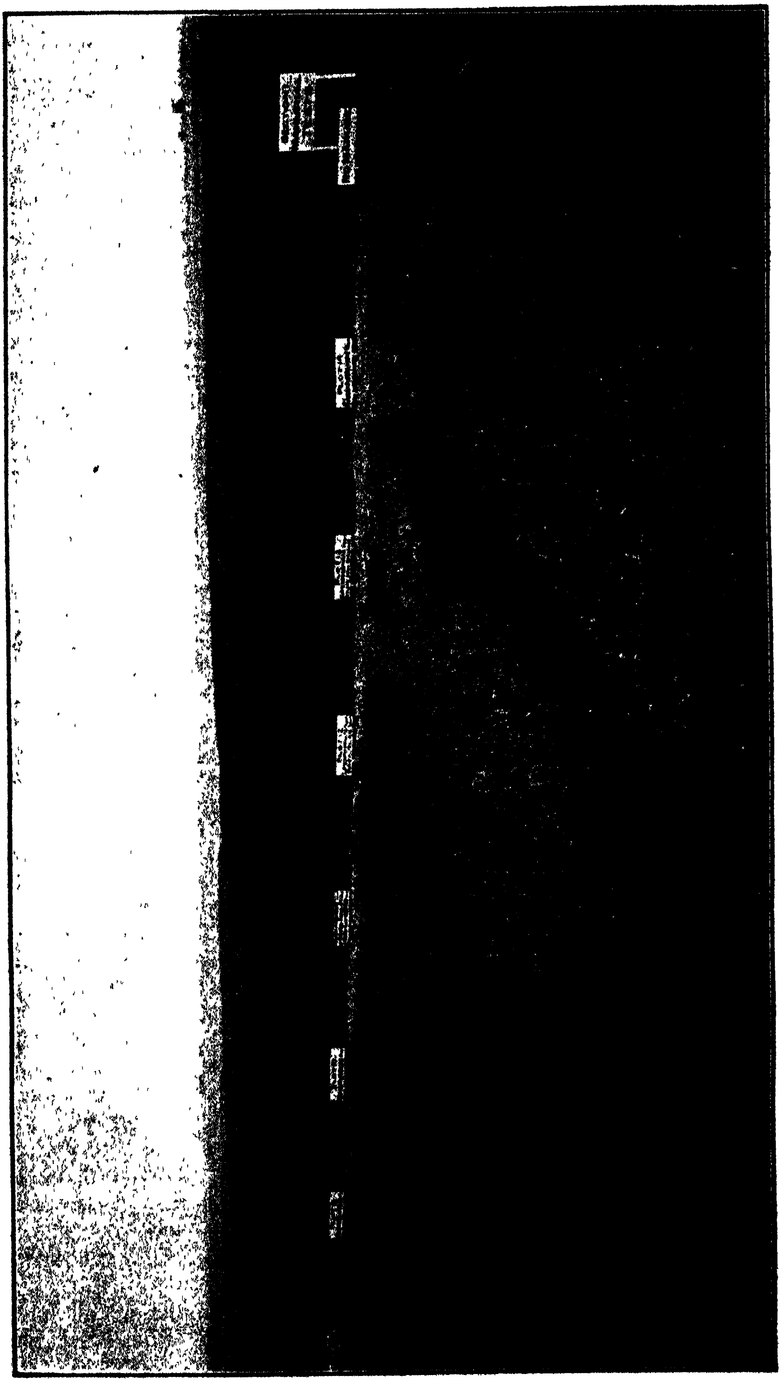


Fig. 32.—View of Permanent Manurial Tests, Longerenong Agricultural College.

TABLE XXXII.

EFFECT OF EARLY AND LATE SOWING ON YIELD OF WHEAT AND PERCENTAGE OF GRAIN TO TOTAL CROP.—STATE RESEARCH FARM, WERRIBEE, SEASON 1922—PLOTS ONE-SIXTEENTH OF AN ACRE EACH.

Variety	Early Sowing.					Late Sowing.				
	Yield per Plot.			Yield per acre.	Per cent. Grain to Total Crop.	Yield per Plot			Yield per acre.	Per cent. Grain to Total Crop
	Total Crop.	Grain.	Straw.			Total Crop.	Grain.	Straw.		
	lbs.	lbs.	lbs.	Bush.	%	lbs.	lbs.	lbs.	Bush.	%
King's Early	322	55	267	14·66	17·0	273	89	184	23·74	32·6
Gluyas	308	41	267	10·92	13·3	280	97	183	25·85	34·6
Federation	266	58	208	15·46	21·8	291	94	197	25·66	32·3
Yandilla King	277	54	223	14·40	19·5	252	78	174	20·80	30·9
Marshall's No 3	280	55	225	14·66	19·6	266	80	186	21·33	30·1
Dart's Imperial	322	50	272	13·33	15·5	315	95	220	25·33	30·1
Average	296	52	244	13·91	17·7	280	89	191	23·78	31·8

The results of this experiment show that though the average total yield of the early-sown plots—grain and straw—is actually heavier than that of the late-sown plots, the yield of grain per acre from the late sown plots is 71 per cent. higher than that of the early-sown plots. With each variety tested the percentage of grain to total crop is much greater with late sowing than with early sowing.

It would appear that in the majority of seasons the wheat crop removes from the soil practically the whole of the available moisture supply.

Both with early sowing and late sowing the amount of *total* crop produced was much the same, the tendency being towards the production of larger total crops from the early sowings.

As, however, the proportion of grain in the late-sown crop is much higher than with the same variety sown early, the yield of grain per acre is greater for the late sowing than for the early sowing.

Under the conditions obtaining in the Wimmera in normal seasons we may safely assume that a well-developed wheat crop will practically exhaust the soil of its available moisture supplies. In doing so, a given amount of dry matter is produced per acre, an amount determined by the transpiration ratio for that particular season. We have already seen that in any given season different varieties of wheat do not vary materially as regards their transpiration ratio for dry matter, though there is considerable variation in the transpiration ratio for grain.

In any given season the available moisture supply of the soil is capable of producing a given definite amount of dry matter, but as the late-sown crops produce a higher proportion of grain and a correspondingly lower proportion of flag and straw, the late-sown crops will produce a greater quantity of grain at lower water cost than the early-sown crops.

Summing up, we may say that the main developments which have brought about an increase in the average yields of wheat in the Wimmera are the following:—

1. The adoption of late seeding, which invariably results in an increase in the grain yield, a marked increase in the proportion of grain

to total dry matter, and a reduction in the water cost of grain produced compared with early sowing.

2. The recognition of the value of fallowing, and of the thorough working of the fallows to retain soil moisture and promote nitrification. Summer-fallowing, or the adoption of a fifteen-months' fallow, is becoming general in the Wimmera.

3. The use of heavy dressings of water soluble phosphate, especially where cultural methods are thorough. Heavy dressings of superphosphate, when supplemented by conserved soil moisture and abundance of nitrates, lead to increased wheat yields at a lowered water cost.

4. The general use of a variety of wheat—Federation—which, under actual field tests has proved to be better suited to Wimmera conditions than any other variety.

Many of the best farmers in the Wimmera are reaping bags per acre where they reaped bushels per acre twenty years ago.

The average yields of a State and the average yields of a district are not a measure, except perhaps in old agricultural countries, of the real productive power of the soil when pushed to the limit. It is a matter of common observation that in any given district of Victoria the best farmers obtain yields two or three times greater than the average of the district.

To obtain some idea of what yields are possible on a given winter rainfall, we are therefore compelled to depart from the study of farms in the mass, and to consider the yields actually obtained on the more progressive wheat farms.

Before doing so, we may consider the results obtained on the Longerenong Agricultural College farm at Dooen.

The following table summarizes the areas harvested, time of sowing, rate of seeding, rate of manuring, and average yield per acre at Longerenong for the past nine years:—

TABLE XXXIII.

SHOWING AREA HARVESTED, TIME OF SOWING, RATE OF SEEDING, AND AVERAGE YIELD PER ACRE ON THE LONGERENONG COLLEGE FARM FOR YEARS 1913-21.

—	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920	1921
Area Harvested	Acres. 265	Acres. 100	Acres. 274	Acres. 361	Acres. 305	Acres. 342	Acres. 242	Acres. 266	Acres 320
Time of Sowing	30th April to 22nd June	14th May to 30th June	20th May to 31st July	Early June to 18th Aug.	23rd May to 30th June	5th May to 7th July	26th May to 7th July	20th May to 14th July	4th June to 8th July
Seed per acre	60 to 70 lbs.	60 to 63 lbs.	50. 60, and 90 lbs.	75 to 90 lbs.	60 to 85 lbs.	74 to 84 lbs.	75 to 85 lbs.	80 to 90 lbs.	85 to 90 lbs.
Super per acre	56 lbs.	70 lbs.	70 lbs.	112 lbs.	100 lbs.	84 and 112 lbs.	100 to 112 lbs.	90 to 112 lbs.	112 lbs.
Average yield per acre ..	26·0 bushels	6·0 bushels	28·0 bushels	34·1 bushels	39·5 bushels	36·2 bushels	27·1 bushels	38·0 bushels	42·0 bushels

The following table summarizes the rainfall records and crop yields for the past nine years:—

TABLE XXXIV.

SHOWING TOTAL RAINFALL, SEASONAL RAINFALL (APRIL TO OCTOBER), CROP YIELDS, AND RATIO, WHEAT YIELD TO RAINFALL, AT LONGERENONG AGRICULTURAL COLLEGE, 1913-1921.

	Month.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921
	January	·60	·42	·55	·87	·61	·72	·06	·30	1·94
	February	3·10	·90	·07	·09	1·66	·69	2·34	·02	1·61
	March . ..	2·20	·65	·12	·03	·74	·84	·97	·76	1·03
Seasonal Rainfall.	April .. .	·60	2·10	1·00	·60	·44	2·10	·13	·08	·29
	May .. .	1·20	1·00	1·09	·41	2·36	1·99	2·22	1·26	2·18
	June	·37	·80	3·98	3·40	·77	2·05	·71	1·97	1·30
	July . .	1·05	·96	1·40	2·25	2·03	1·44	1·25	1·60	1·85
	August ..	2·05	·20	2·54	3·47	1·91	2·21	·91	3·18	1·83
	September .	3·75	·15	4·04	4·03	2·27	·45	1·15	1·98	1·97
	October : .	2·22	·09	1·03	1·95	3·01	1·68	·56	1·26	1·28
	November ..	1·03	2·23	·20	2·65	·51	·21	·14	1·88	1·52
	December . .	·83	2·70	·58	1·80	·48	·37	1·04	·82	·86
Total inches .. .		19·00	12·20	16·60	21·55	16·79	14·75	11·48	15·11	17·66
Rainfall, April–October ..		11·24	5·30	15·08	16·11	12·79	11·92	6·93	11·33	10·70
Yield per acre for whole farm (bushels)		26·0	6·0	28·0	34·1	30·5	36·2	27·1	38·0	42·0
Ratio, Wheat Yield to Rainfall		2·3	1·1	1·8	2·1	2·3	3·0	3·9	3·4	3·9

These records of crop yields are highly significant. They are the more valuable because they represent the average yield from a considerable area of crop, and include the whole area sown for grain each year. It will be noted that the combined effect of the liberal dressings of fertilizers, late seeding, and increasing the quantities of seed as the seeding season advances, have resulted in remarkably heavy crops during the past four years. Notwithstanding the fact that the last four seasons were drier on the whole than any four consecutive seasons hitherto experienced, the average yields were much higher.

Thus the average rainfall for the last four years was 14.75, of which an average of 10.22 fell from April to October. The seasonal rainfall for these years is *below* the average of the State and *below* the average of the Wimmera district for 30 years. Notwithstanding these facts, the average wheat yield for the four years was 35.8 bushels, or 3.50 bushels of wheat for every inch of seasonal rain. That is to say, the wheat yields obtained at Longerenong for the last four years are practically the maximum yields that might be expected if the whole of the rainfall received between April and October were transpired by the crop and no losses were experienced by evaporation.

Evaporation losses from the soil during the growing period of the crop are, of course, inevitable. These losses can be ascertained with certainty only by growing the crops under field conditions in specially constructed drain gauges. Large as the losses by evaporation may be, it is probable that they are at least counterbalanced by the moisture conserved from the previous year by bare fallowing. In fact, in a typical year at Longerenong, the writer showed that a well-worked fallow conserved by the 1st of April, in the first 4 feet of soil, an extra 4.14 inches of rain compared with pasture land, and extra water equivalent to 3.43 inches of rain compared with a neglected fallow. Hence, assuming the water lost by evaporation from the soil is approximately equal to the amount conserved by fallowing, the seasonal rainfall during the past four years gave a wheat-yield which was approximately equivalent to the theoretical maximum.

Finally, if we consider the yields obtained on private farms, we find equally striking results. Two authentic cases will suffice for purposes of illustration.

The Nhill Agricultural Society has for the past 20 years conducted annual crop competitions for the best 100 acres of crop. These competitions have had a marked influence on stimulating improved wheat methods in the district. Each year the crops entered for competition are judged by responsible officers of the Department of Agriculture, and crop yields are taken into consideration in determining the awards.

Mr. R. O. Blackwood, of Kiata East, who has been a consistent competitor in these competitions, obtained for the past five years the following average yields:—

TABLE XXXV.

SHOWING TOTAL RAINFALL, SEASONAL RAINFALL, AND RATIO WHEAT YIELD TO RAINFALL, ON R. O. BLACKWOOD'S FARM, KIATA EAST, WIMMERA, 1917-1921.

—	Rainfall (Total).	Seasonal Rainfall (Apr.-Oct.).	Acreage Harvested	Average Crop Yield (bushels.)	Ratio $\frac{\text{Wheat Yield.}}{\text{Rainfall.}}$
	inches.	inches.	acres.	per acre.	
1917	18·57	14·07	100	45	3·19
1918	14·25	11·80	100	39	3·30
1919	12·09	7·09	100	30	4·23
1920	17·15	13·81	100	36	2·59
1921	14·73	10·16	100	48	4·72
Average for 5 years	15·36	11·39	100	39·6	3·48

For the past five years Mr. Blackwood obtained on an average rainfall of 11.39 inches during the growing period an average wheat yield of 39.6 bushels per acre, and reaped on an average of 3.48 bushels of wheat for each inch of seasonal rainfall received.

Somewhat similar results have been obtained by Mr. Walter Dahlenburg, of Salisbury (Wimmera district) for the past four years. These results are summarized in Table XXXVI.

TABLE XXXVI.

SHOWING TOTAL RAINFALL, SEASONAL RAINFALL, AND RATIO WHEAT YIELD TO RAINFALL, ON W. E. DAHLENBURG'S FARM, SALISBURY, SEASONS 1919-1922.

—	Total Rainfall.	Seasonal Rainfall (Apr.–Oct.).	Average Yield per Acre.	Ratio $\frac{\text{Wheat Yield.}}{\text{Rainfall.}}$
	inches.	inches.	bushels.	
1919 ..	9·16	5·54	18·0	3·3
1920 ..	12·80	10·56	39·0	3·7
1921 ..	10·74	8·49	36·0	4·1
1922 ..	11·55	9·38	30·0	3·2
Average 4 years ..	11·06	8·49	30·75	3·6

The results obtained by Mr. Dahlenburg are of great interest. For the past four years the total average rainfall for Salisbury has actually been less than the average *seasonal* rainfall for the wheat belt of Victoria, South Australia, and the Wimmera for the past 30 years.

His average yield per acre for the past four years on an average seasonal rainfall of 8.49 inches has been 30.75 bushels per acre, and he has reaped an average of 3.6 bushels for each inch of rain received during the growing period of the crop.

From a consideration of the investigations into the water requirements of wheat at Rutherglen and Werribee, we conclude that the average requirement for a period of five years during which the investigations were made was for dry matter 395, for grain 1,067, which implies that wheat could yield on an average 3.54 bushels of grain for each inch of water transpired. For the State, as a whole, we are obtaining much less than one-third this amount. The Wimmera, as a whole, produces less than half this amount. Individual farmers, however, are actually securing the full wheat yield possible on the rainfall.

If the many could be encouraged to do what the few are already doing, it is evident that the average yield of wheat for the State could at least be doubled.

The composite winter rainfall for Victoria for 30 years is 11½ inches This is sufficient for the production of a 40-bushel wheat crop. In other words, if we assume that the winter rainfall is wholly transpired by the wheat crop, and the water losses from the soil by evaporation were balanced by the water conserved by fallowing, the rainfall of Victoria is sufficient to produce an average yield for the State, of 40 bushels per acre. This average has actually been obtained by our best farmers, though the present State production averages only one-third of this amount. Clearly, wheat production in Victoria can be greatly increased before the limits imposed by the rainfall are approached.

(*To be continued.*)

PASSION FRUIT CULTURE IN VICTORIA.

(Continued from Page 345.)

By J. Farrell, Orchard Supervisor.

X.—Drainage.

Although the passion vine is capable of accommodating itself to a wide range of soils, provided the climatic conditions are favorable, also geographically both in respect to latitude and altitude, its powers of making a congenial home under the varying circumstances will never overcome its antipathy to sour soil conditions created by stagnant water. There is, therefore, no phase of passion fruit culture that requires more careful and prompt attention than drainage. To maintain healthy and vigorous growth in the vines, it is obvious that, during the main vegetative periods particularly, the soil should be kept in a sufficiently moist state to allow the feeding roots to absorb the soil-assimilated plant foods, and this favorable condition is more easily maintained in drained than in undrained land. Now, sourness created by stagnant water, especially in heavy clays with retentive subsoils, may be regarded as the antithesis of the passion vine's requirements.

Through want of drainage, the soil becomes saturated, its interspaces being thus filled with water which prevents aeration, and while in this state beneficial bacterial activity is suspended and acidity develops. Such a state is also unfavorable for the growth of cover crops for green manure, and, even when fairly well grown and ploughed under in such wet land, the process of their decomposition is often unsatisfactory. The rate at which the chemical changes necessary to produce soluble plant food proceed is so slow that its completion is often too late to be of much service to the vines during the succeeding period of growth. It is frequently impossible to plough such land in early spring, and when dry enough to cultivate later, it usually turns over in hard sods. This involves extra expense by operating against bringing the soil into an early, fine state of tilth. When the surface earth is shallow, and frequently even when cultivated, the subsoil, if tenacious, cracks badly during hot weather, permitting the capillary moisture to escape. There are two factors, surface drainage and sub-drainage, involved in conducting the surplus water from the passion plot.

SURFACE DRAINAGE.

Before the winter rains commence, provision, through the medium of a system of small surface drains, should be made for carrying off the surface water from the planted area during the rainy season. This method should be practised more carefully where underground drains have not been established, as the necessity of coping with surface drainage has become more apparent during recent years owing to the almost regular recurrence of wet winters. A planted area consisting of flat land is usually surface-drained by a series of plough furrows running parallel to each other and connected at right angles with a head ditch or drain leading to a lower level; whereas the contours occurring in undulations are made the basis of surface drainage operations. In both instances, when autumn ploughing is being carried out the soil should be drawn towards each trellis on both sides, and the furrows created between them made to serve as surface drains. It was previously stated that, in planting, the rows of vines should, where practicable, be made to run north and south, so that the morning sun may strike the east side of the trellises, and the west side receive the sunlight in the afternoon. A slope to the north suits this method of planting best, and also affords better facilities for surface drainage of the nature explained, because trellises running north and south, on an easterly slope, preclude ploughing with the fall of the land. Abrupt slopes, with loose surface soil, should not be ploughed immediately before winter, as heavy rains sometimes cause them to wash away.

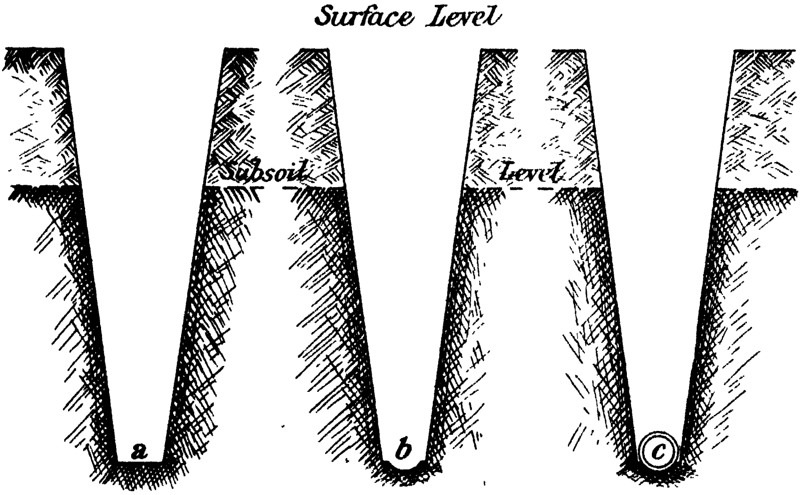


Fig. 19. Cross-section of Tile Drain in course of construction.

SUB-DRAINAGE.

The soil of the passion plot may be saturated and the vines water logged by springs or spewy subsoil, by water accumulated from seepage or by rain water being allowed to settle on the block. The last-named condition is of most common occurrence, and to prevent or remedy this sub-drainage should be resorted to, although, in some cases, the trouble may be averted by proper surface drainage. The favorable soil conditions accruing from sub-drainage in the orchards and passion fruit plantations offer better facilities for spraying, pruning, and early spring cultivation, &c., and the heavier crops of fruit which are obtained from the extensive areas at present sub-drained demonstrate most convincingly the further advantages which follow this practice.

When it is intended to irrigate a passion plot either by channel or dam system, and where the soil by its character does not afford free natural drainage, provision should first be made for drawing off the surplus water supplied by irrigation. Surplus irrigation water lodging on impervious clay subsoils creates unpleasant conditions for the vines, although the results are generally much less serious than those produced by winter and early spring lodgment.

The most suitable time for carrying out drainage operations is during winter, when the subsoil has become sufficiently moist to make it amenable to ditch excavation, and labour for the work is then more easily obtained. Tile drains are now almost exclusively employed, and these are placed at a depth of from 2 ft. 6 in. to 3 feet, according to the depth of the surface soil, and 12 feet, 24 feet, or 36 feet apart, according to requirements. The pipes may be 2 inches or 3 inches in diameter, according to the length of the drains, and made to deliver the water into a head ditch or may be connected with a cross-drain made of 4-inch pipes. Fig. 19 depicts in cross-section a pipe drain in course of construction. When the soil lends itself to free working, the drain excavation is commenced by opening up, with the plough, a furrow as deep as possible. This is made deeper still by an ordinary spade, and a special draining spade, 4 inches wide at the edge, completes the work as shown at (*a*). A draining scoop cuts out the portion of earth marked (*b*) and rectifies inequalities in the grade of the bottom decline, thus offering a solid and suitable bed for the tiles as shown at .(*c*), before the ditch is filled in. Ordinary unglazed, porous, 12-inch kiln-burnt tiles are used, and when placed in position they should fit closely together as shown in Fig. 20, longitudinal section of drain.

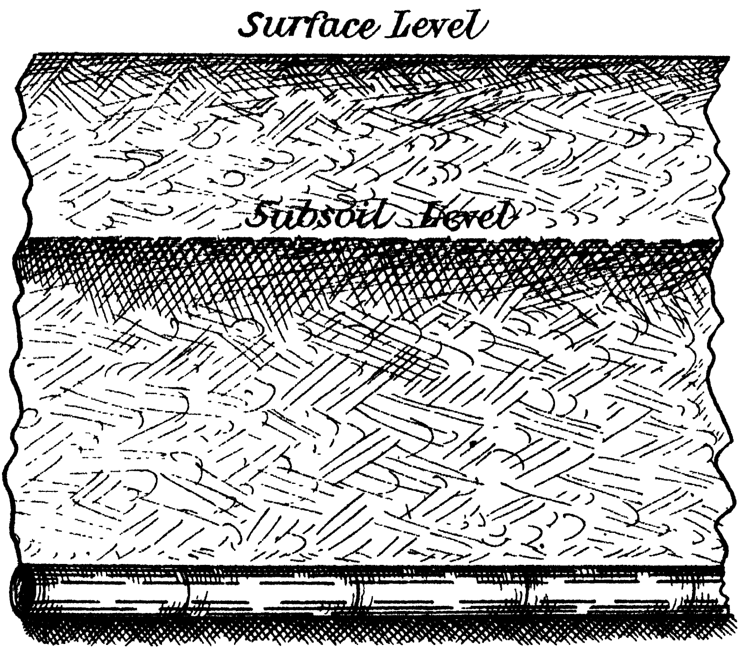


Fig. 20.—Longitudinal section of Tile Drain showing pipes fitting closely together.

If the drains be made too shallow, the water-table created in the soil by the working of the drains during spring is usually at a higher level than would afford maximum feeding facilities for the larger vines, when their roots penetrate well into the subsoil. On the other hand, if the drains be dug too deep, the greater body of excavated subsoil on being returned to its original position often becomes puddled and forms a catchment for surface water.

In planning the under-drainage system of an area composed of level land, it is sometimes preferable to open a head ditch, into which the parallel pipe drains are made to deliver the water, rather than to connect them with the 4-inch pipe drain previously mentioned. The bottom of the ditch should be 4 inches below the point of water delivery from the pipes, so that these may not become blocked up with silt or *débris*, and the ends of the pipes entering the open drain should be covered with galvanized iron wire netting, ½-inch mesh, to exclude rats and other vermin.

When minor surface inequalities occur in the plane of a slope to be drained, these may be overcome by altering the depth of the lateral drains at the various points where necessary to insure gravitation to the open ditch or head drain. Where several planes, with various degrees of decline, are involved in the drainage system, however, the main drains, whether open or piped, must be carried systematically along the lowest parts. There the small parallel drains of each plane should, when practicable, run with the greatest fall and junction at the necessary angles with the head drain or ditch. Sometimes rather steep declines, owing to cross impervious under-strata or spewy subsoil, need under-drainage more than less abrupt slopes which offer better natural drainage. Generally speaking, the lateral drains should run with the trellises, but to obtain the best results, it is sometimes, owing to the lay of the land, desirable to construct these diagonally across the plane to be drained.

Fuller details and illustrations relative to orchard drainage may be found in this *Journal* for April, 1918.

XI.—Irrigation.

Up to the present, irrigation of passion vines has received only scant attention; but such a condition of affairs is likely to be altered considerably in the not far distant future. This assertion is based on the fact that growers and others interested in passion fruit culture now better understand the requirements of this mostly surface-rooted, gross-feeding evergreen. This has special reference to persons associated with its cultivation in the southern undulating districts, dependent on dams for a water supply for orchards, &c. The store of knowledge already gained will soon be further augmented by the experience of many others who have signified their intention of establishing passion fruit plantations in the northern areas served with channels.

The warm, dry conditions experienced here during summer, causing excessive evaporation from the passion fruit plots, as well as transpiration from the leaves of the vines, quickly deplete the soil moisture accumulated during the previous winter. Then, owing to our comparatively light summer rainfall being usually insufficient to replenish these losses, irrigation becomes essential if the best results are to be obtained. Knowing that the vines absorb their food in a state of solution, it is obvious that the soil around the feeding roots should be kept sufficiently moist to maintain the solution during the main vegetative periods particularly, so that the plants may be enabled to make good growth, fruit satisfactorily, and store up energy for the following year.

Because of the variations of temperature and the fluctuations in the quantity and frequency of our summer rains, the amount of water to be used and the number of waterings to be applied to keep the soil in the necessarily moist state cannot be definitely fixed. However, the new settler commencing operations in a passion fruit centre, with the assistance of the departmental experts, by associating with the local growers and by intelligent application to his work, should soon become acquainted with the principles governing the artificial application of water to the passion plot. When he thoroughly understands climatic influences on the soil, the advantages of watering same, its cultivation and the main requirements of his vines, irrigation, which at first usually appears intricate, resolves itself into a rather simple proposition, provided good drainage exists, and that the soil be friable and of a character amenable to general cultural treatment.

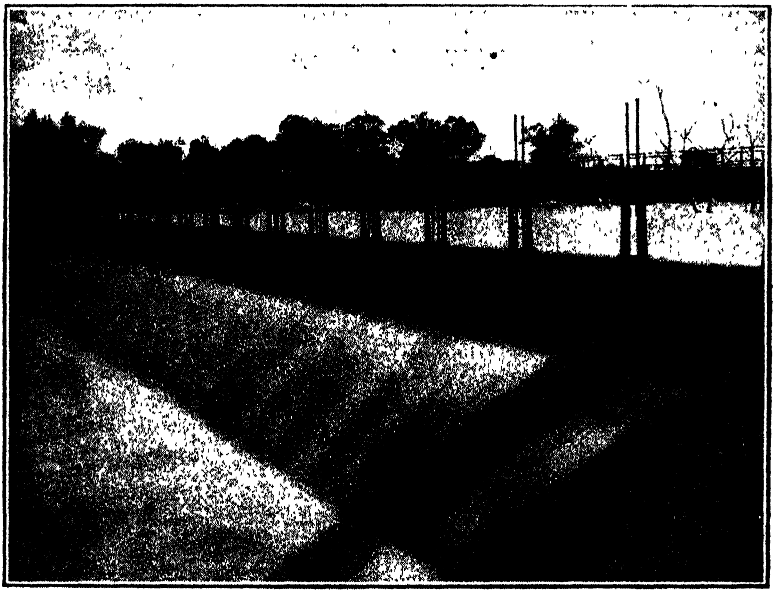


Fig. 21.—A view of the Goulburn Weir.

THE CHANNEL SYSTEM OF IRRIGATION.

This consists mainly of a dam or weir being placed across a river or other water-course, causing the water to bank up, and at the higher level it is deflected through suitably placed delivery ducts into main articulation channels, in which it is carried to the different irrigation settlements. Having reached these points, the water is diverted at suitable levels into the necessary number of smaller channels which in turn supply the individual orchards.

Fig. 21 illustrates the Goulburn Weir, from which a number of the northern irrigation areas are supplied. The State Rivers and Water Supply Commission control this and other channel irrigation systems. Fig. 22 shows a main articulation channel entering an orchard settlement area. Then there are the smaller channels which branch off from the main ones and supply the orchards. From a study of these illustrations and an idea of the functions of the smaller supply channels, the reader will be enabled to gain a fairly comprehensive knowledge of the engineering in connexion with, and the general principles involved in, the practice of modern irrigation. When the smaller supply channels are conveniently arranged, the surface perfectly graded, the soil deep, rich, and friable, with permeable subsoil to afford good drainage, successful cultivation is assured.

Some years ago, the method of irrigating an orchard was to flood the whole area with water to a depth of from 4 to 6 inches, irrespective of the condition of the soil or the individual requirements of the trees. This method soon proved unsatisfactory, and the water is now made to flow through narrow outlet boxes or short pieces of piping, inserted in the bank of the channel, into plough furrows which run down the orchard between the trees. There is every reason to believe that this method of watering would suit passion vines; but from the writer's knowledge of the needs of these, it is safe to say that they would be better served by frequent light waterings than by occasional heavy ones. As the passions appreciate intensive working of the soil, it is advisable to cultivate as soon as possible after each watering.

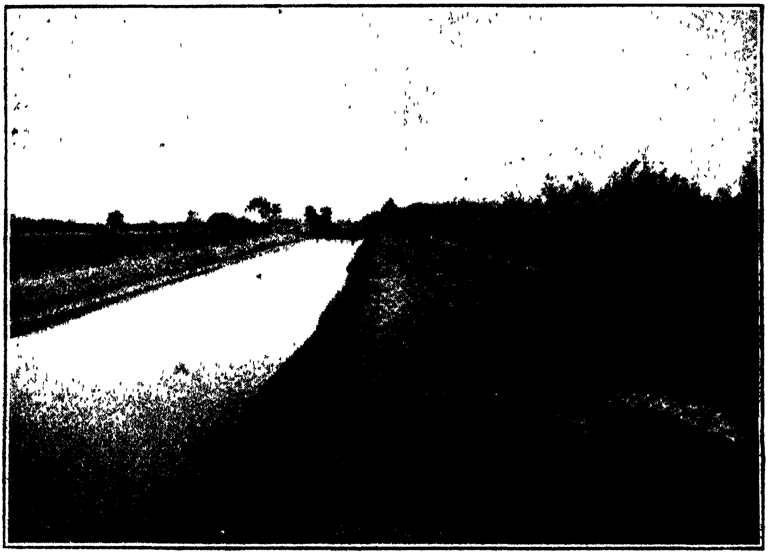


Fig. 22.—A Main Articulation Channel entering an Orchard Settlement Area.

For further particulars and illustrations relative to the methods adopted in channel irrigation, see the June, 1918, number of this *Journal*.

THE DAM SYSTEM OF IRRIGATION.

This is the method of irrigation employed by orchardists in the central and southern hilly districts of the State, where, owing to the irregular physical features of these parts, and the absence of natural permanent streams at sufficiently high levels, regular supply is lacking. Fortunately, however, the winter rains experienced in these localities are usually ample, when the water is systematically accumulated and carefully stored, to supply the normal irrigation requirements of the local growers during summer. The soil moisture, especially if cultivation be at all neglected, quickly dries out under the influence of the summer sun, and particularly on the northern and eastern slopes of these undulations. Many dam systems are now established, some are in course of construction, and through necessity others must follow to meet the needs of enterprising rural workers.

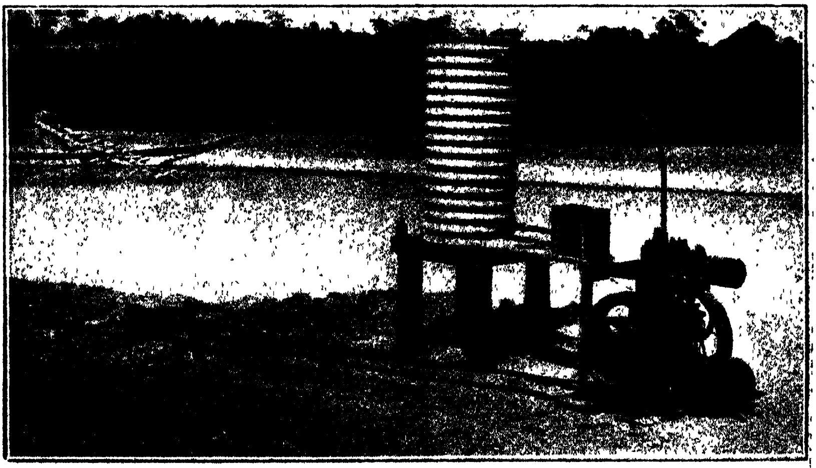


Fig. 23.—A Dam on a Slope.

DAM CONSTRUCTION, WATER ACCUMULATION, STORAGE, AND DISTRIBUTION.

When selecting a site for a dam for irrigation purposes, the question of the situation for accumulation of water and its distribution by gravitation should be borne in mind. The subsoil of the ground chosen for the excavation and for forming the embankment should be of a retentive character, so that there may be no seepage of water from the dam when constructed, as mistakes are often made in selecting sites on porous clays. When this happens, the orchardist is deprived of the use of much of the water during summer, and the vines immediately below the dam may suffer from the seepage as well.

Even if any part of the soil of a main slope will hold water, the ground contour of the surroundings should be fully considered before the position for the dam is decided on. An area on which small depressions with suitable lateral decline converge should be chosen, as by this means an adequately extensive water-shed is provided, and ample catchment insured. When the excavation is made and the embankment completed, a few small drains or plough furrows running diagonally across the slope and converging on the dam will carry in the surface water.

The construction of the dam should be commenced by removing all the surface soil from the area required for the dam, and also from that portion where the base of the embankment will rise, as this soil, being porous, is unsuitable. This soil may be used for filling in minor depressions in the surface of the planted area where necessary. Fig. 23 illustrates a dam constructed on the lines described, and very often such a dam could be filled several times during the rainy season. When vines are planted on the summit of an elevation, a reservoir like that shown in Fig. 24 may be constructed on the highest point of the elevated part and filled from the dam lower down the slope, and this refills again before the rains are over. In constructing the dam and reservoir, outlet pipes are placed in the embankments, and by means of these the planted areas controlled by the different catchments are watered. The water is drawn from the dam and transferred to the reservoir by the three-horse-power oil engine, shown in Fig. 23. The water is drawn from the dam through the 2-inch suction pipe (*a*), by the centrifugal pump (*b*), operated by means of a belt from the driving wheel, and forced through the pipe (*c*) to the reservoir. When liberated by means of the outlet pipe, the water may be applied to the vines by means of plough furrows as in the case of channel irrigation. One furrow on each side of the trellis is sufficient, and care should be taken that the water is not applied except when necessary, because, although the passion likes a fairly moist soil, the waterings should not be too copious.

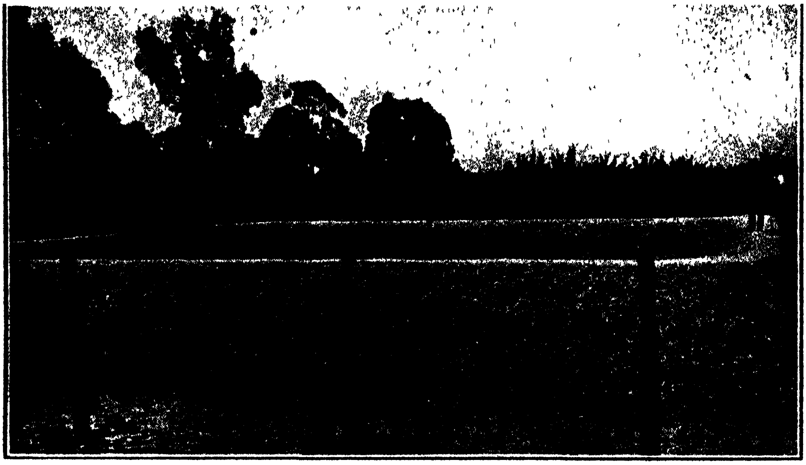


Fig. 24.—A Reservoir on an Elevation.

For further particulars relative to the dam system of irrigation see the August, 1918, number of this *Journal.*

(*To be continued.*)

THE COMPARATIVE VALUE OF FOODSTUFFS.

By R. T. McKenzie, Senior Dairy Supervisor.

It is important, in these days of commercial enterprise, with many kinds of foodstuffs at different prices, that the farmer should know whether he is getting, not only the best food for his stock, but, at the same time, the best value for his money. It frequently occurs that the dearest feeds are not always the best value, prices being governed by the available supplies of raw material and the fluctuating demands of buyers for the finished article.

All animal foodstuffs contain certain digestible nutrients, each serving a definite purpose. By a thorough knowledge of their composition, the farmer will in many cases be able to avoid errors and save money. To do this, however, he must be able to appreciate the difference in value of the different constituents of foods and their effect upon his stock.

All foods originate from the simple inorganic elements, such as carbon, hydrogen, nitrogen, oxygen, lime, phosphorous, &c. These elements are converted into compounds of more or less complexity through the vital energy of the vegetable kingdom. All growing plants extract from the soil mineral and nitrogenous constituents of varying proportions, and with carbon from the air build up their structures, which contain albuminoids, starches, sugars, salts, &c., necessary for the sustenance of animal life. Like a machine, the animal body is subject to wear and tear. The material of which it is composed gets used up and waste ensues. To keep the body, therefore, in a normal and healthy condition, the waste must be repaired. Further, a certain amount of heat is necessary to keep the body at a proper temperature.

The quantity and quality of the food, consequently, must be of such a nature as will respond to these demands of the animal, and also provide an excess of digestible food to be stored up in the body. The ox requires excess for bodily exercise, the horse for external mechanical work, and the dairy cow for the production of milk.

An abundance of food may be given, yet if it is deficient in some important nutrient the animal will suffer. On the other hand, it may contain all the necessary ingredients, but not in sufficient quantity to meet the demands required of it.

The average farmer does not always comprehend the analysis of the chemist when he specifies the various constituents of a food. These may, for all practical purposes, be divided into six groups, namely, moisture, albuminoids, carbo-hydrates, oil or fat, crude fibre, and ash. They can be dealt with in that order.

Although moisture has no feeding value, it is a natural constituent of every food; even those usually considered dry contain 10 or 12 per cent. moisture. With various kinds of oil cakes, excessive moisture might lead the farmer to think that by purchasing a "soft" cake he is getting one with a large percentage of oil. This "softness" if caused by additional moisture, gives no extra feeding value to the cake, but a hard or dry-looking cake may be crushed from the natural seed and contain no superfluous moisture.

Albuminoids are the substances containing nitrogen, and form the most important constituent of a food. They are distinctly flesh-formers, and their function is to replace the wasted tissues and build up the nitrogenous tissues of the growing animal.

Nitrogen forms about four-fifths of the atmosphere, but animals cannot take it from this source; they must have it in a combined state; therefore in their food. If there is a slight excess of the flesh-forming elements in a food, it may be stored up in the body as fat, which, if required, can be used to produce heat and energy. But this is not the essential function of the flesh-forming elements, and a properly-constituted food contains them only in such proportions as can be properly digested, and so keeps the tissues at their best. The use of them in excess will disturb the digestion and produce the condition known as "heating".

Soluble carbo-hydrates, which consist of carbon and water, include several substances, such as starch, sugar, and digestible fibre. The amount of soluble carbo-hydrates is affected to some extent by the degree of fineness to which the food is ground. Finely-ground food will allow the gastric juices to have access to the most minute particles, and thereby make a larger proportion available for digestion. The carbo-hydrates in the process of digestion are oxidized in the tissues, and heat is generated. Thus they supply energy, maintain bodily heat, and store up in the body a certain quantity of fat, or "condition," as a reserve to draw upon at need.

Fat or oil is used for the same purpose as carbo-hydrates, that is by their oxidation in the blood, heat is created, but a given weight of fat or oil is considered to be equal to two and a half times the same weight of carbo-hydrates.

Crude fibre is that portion of a feeding stuff which, after going through a similar process to the one taking place in the digestive organs, remains insoluble. But while its actual digestion may not be carried out to any great extent, it is necessary to form the bulk, so essential to herbivorous animals. Crude fibre also acts as a mechanical aid to digestion by helping to split up the other parts of the food, so that they can be more easily absorbed by the body.

Ash consists of mineral matter present in food, and is necessary for the formation of bone, to provide the saline constituents and acids of the blood, gastric juices, and other fluids of the body. There is a very close connexion between their presence in the blood and the quality of stock produced. Any unused mineral matter passes through the bowels.

How, then, can the farmer arrive at the comparative value of the various foodstuffs? As a result of numerous experiments by experts, the following is the method usually adopted. It takes into consideration the three main constituents of food, viz., albuminoids, soluble carbohydrates, and fat, these being the only elements of vital importance to the farmer.

The albuminoids and fat are considered of equal value, and one unit of these is worth two and a half units of carbo-hydrates. The percentage of albuminoids and fat is therefore added together, then multiplied by two and a-half, and to the figure thus obtained the quantity of carbo-hydrates is added, the total being called the "feeding units" contained in the food. For instance, the analyses of bran and crushed oats (two popular concentrates for milking cows) are as follows:—

	Albuminoids.	Carbo-hydrates.	Fat.
Bran	11.2 ..	42.2 ..	2.5
Crushed oats ..	9.2 ..	47.3 ..	4.2

In order to get the feeding units, add together—

BRAN.

Albuminoids	11.2
Fat	2.5
That is	13.7
Multiply by	2.5
Which gives	34.25
Then add carbo.	42.2
Showing total feeding units	76.45

CRUSHED OATS.

Albuminoids	9.2
Fat	4.2
That is	13.4
Multiply by	2.5
Which gives	33.5
Then add carbo.	47.3
Showing total feeding units	80.8

By this method the farmer can bring all his foodstuffs down to a common basis for comparing prices. The greater the number of feeding units the more valuable is a food for feeding purposes. By taking the market price of each foodstuff and dividing same by its total feeding units, the cost of a food unit can be ascertained, and thus a comparison of prices can be easily made. In the two examples above quoted, it will be seen that in 1 ton (2,240 lbs.) of bran, there are 76.45 feeding units. The present (April, 1923) market price of bran is 180s. per short ton, equal to, approximately, 201s. per ton of 2,240 lbs. (201s., divided by 76.45, gives the cost of a food unit of bran as 2s. 7½d.). The total feeding units in a ton of crushed oats are 80.8. The present (April, 1923) market price of crushed oats is 4s. per bushel—a ton of 56 bushels costing 230s. 8d. This amount divided by 80.8 gives the cost of a food unit of crushed oats as 2s. 10¼d. From these figures, it will be seen that there is little difference in the money value of these two foods at their respective prices. In this way, it is possible for the farmer to ascertain the value of the food units of any foodstuff he may be using.

A good food for the dairy animal should contain the nutrients herein described in such proportions as will permit the greatest possible nourishment to be extracted from them, and must be of sufficient bulk to satisfy all requirements, namely, to maintain the body heat, repair and build up the tissues, and produce milk, without upsetting the digestion or causing loss of flesh. If it is not possible to get one food that will meet these requirements, the ration must be so arranged that its several components will do so in the aggregate. Such a food is called "well balanced," and from a "well-balanced" ration the animal can extract the greatest possible amount of nutriment.

HOME BUTTER-MAKING.

R. T. Archer, Senior Dairy Inspector.

The development of the dairying industry, which has for 30 years past been one of the most important and valuable in the State of Victoria, has been due to the establishment of the butter factory and creamery system.

By the factory system, large quantities of butter of uniform quality were made available for export to oversea markets. Before the inception of that system, butter was made by individual farmers, and generally sent to the large city sale rooms from which retailers obtained their supplies. The surplus was bought by merchants, blended by machinery so as to make it uniform in quality, then packed and exported to oversea markets. This surplus was purchased at practically the buyers' own price, with the consequence that the amount obtained by the producer was small indeed. The introduction of the factory system put an end to butter making on the farm, except in special cases where the butter could be retailed direct to the consumer.

It has never been the policy of the Department of Agriculture to encourage home butter making, for although such butter might be just as good as that from the factory, the farmer would not obtain nearly its value, nor as good a return as if he sent his milk or cream to a factory.

It is recognised, however, that there are many isolated cases where it may be better to make the cream into butter on the farm, and it is for such cases that the following instructions are intended.

Care of Cows.

For the production of choicest butter, which should be the aim of all, it is essential that due attention be given to the production of clean sweet milk and cream. The cows' feed should be of a sweet, wholesome nature; strong smelling food such as rape, turnips, &c., should not be given. The water supply should be clean, easy of access, and plentiful. Running streams or bores are ideal. If the supply is from a dam, the dam should be fenced in and the water pumped by windmill or other means to troughs. The shed, its approaches and surroundings, should be kept as clean as possible to lessen the chance of dust, particularly particles of dried manure, finding access to the milk.

Utensils—Care of.

The utensils should be of well-tinned steel (or glazed earthenware) with joints filled flush with solder. No bare steel showing rust should be seen.

To clean the utensils when they have been used for milk:—First, rinse out with cold or tepid water; then scrub with hot water in which washing soda is dissolved. Always use a brush, not a cloth, as the latter is very difficult to keep clean. Rinse with boiling water, or if a boiler is installed, sterilize with steam; then turn upside down to drain and dry in a clean dairy away from dust.

Care in Milking and Separating.

Floors of cow shed and yard should be impervious—brick or concrete if possible. The cow bails should be lime washed; this will help to keep down flies, one of the greatest sources of contamination. Before milking, the cow's udder should be washed with clean water, and flanks and thighs wiped with a damp cloth to prevent as far as possible dust and hair dropping into milk.

Milk with clean hands. Strain the milk immediately through a double fold of butter cloth. Run through the separator as soon as possible, as the separator acts as a purifier. It takes out all the solid dirt which unavoidably gains access to the milk no matter how careful one is. For this reason, the separator should be taken to pieces, and thoroughly cleaned every time it is used. The separated cream should contain from 40 to 45 per cent. of fat. Cream of this consistency may be easily stirred, and will not contain too much milk. If there is too much milk left in the cream it will go sour quickly; the casein will coagulate or curdle, and small particles of curd will be mixed in the butter; this will cause it to go rancid quickly.

Treatment of Milk where Separator is not Available.

If a separator is not used, the milk should be strained immediately it is drawn into a tinned steel milk dish or earthenware bowl. In summer the milk may then be allowed to stand for about 36 hours and in winter 48, but should always be skimmed before it curdles. The cream when skimmed should be mixed thoroughly and allowed to stand for a few hours. In about 48 hours from the time it is taken from the cow it should have developed a nice clean acidity and be ready for churning. If left too long, it will develop stale and other objectionable flavours, which will be conveyed to the butter. The temperature of the room where the cream is kept should be within a few degrees of 60 deg. Fahr. If allowed to become too cold in the winter bitter flavours may develop; if too hot in summer, stale, rancid, and heated flavours will result. If the temperature of the cream be above 60 deg. Fahr. when it is churned, the butter will be greasy, and a lot of the fat will be lost in the butter milk. It should not be much lower than 60 deg. in winter, or it will take too long to churn; in summer time it should be from 56 to 58 deg. In butter factories much lower temperatures are found necessary, generally below 50 deg. Fahr. A good dairy thermometer is obtainable for a few shillings, and should always be used. It is impossible to guess the temperatures.

In some districts there may be difficulty in maintaining the cream at a reasonably low temperature during the summer. In such cases the water bag principle may be applied, *i.e.*, the vessel containing the cream may be placed in a large canvas bag, or a double bag with space in the centre, in which to stand the vessel. The evaporation of the water will keep the temperature down. The Coolgardie safe also will assist in this direction.

Control of temperatures is one of the two chief essentials for successful butter making—the other is cleanliness at all stages.

Cream should never be permitted to remain near anything with a strong smell, such as apples, soap, kerosene, &c., as the cream will absorb any strong odours with which it comes in contact.

Churning.

Prepare the churns by putting in it some boiling water. Place the lid on, and rotate the churn or the dasher, so that the inside may be scalded thoroughly. This closes the pores of the wood, prevents the cream soaking in and the butter sticking. Care should therefore be taken at all times to see that cream or butter does not come in contact with dry wood.

When the churn is being scalded, the lid should not be closed down tightly until the air is driven out or the churn may be seriously damaged by the expansion of the heated air. After scalding the churn should be cooled with cold water before the cream is put in it. All wooden utensils should also be scalded and then cooled by soaking in cold water.

Churn steadily, not too quickly nor too slowly; experience will soon teach the correct speed for the different churns. If the churn is airtight, the lid should be lifted a few times after churning is commenced to allow the gas to escape. The churning operation sometimes takes a longer and sometimes a shorter time; if the temperature is correct and the cream not too thin, it should start to break in about 30 minutes, and certainly in less than 45 minutes. As soon as the cream starts to break a little cold water should be added. This dilutes the butter milk, hardens the grain, and results in a minimum amount of butter milk being left in. Churning is then continued until the granules are about the size of sago, and the mass has the appearance of the grain of cauliflower.

Washing the Butter.

The butter milk is then run off through a wire gauze strainer, and is replaced by about the same amount of clean cold water. Rotate the churn or the dasher a few times slowly, and run the water off. Repeat this until the water comes away almost clear. Two washings will usually be found sufficient.

Salting the Butter.

If only a small quantity of butter is made, the salt may be worked into the butter with a wooden pat. For a larger quantity a worker will be required. The butter is weighed, placed in a bowl or on the table of the butter worker, and salt distributed evenly over the mass at the rate of about half an ounce to the pound of butter, and worked in thoroughly. To ascertain when the salt is sufficiently worked in, allow the butter to stand until the following day, then cut it; if it is streaky it indicates that the salt has not come in contact with all the butter, and requires a little more working. A few trials will show how many revolutions of the worker will be required. Only the best dairy salt should be used.

Colour.

At times when there is no green feed available, the butter may be very white in colour. It should be none the worse for that, but fashion or fancy may prefer it with some colour. In this case a few drops of "butter colour" (Annatto) may be added to the cream in the churn.

EGG-LAYING COMPETITION.

Report on Twelfth Competition Conducted at Burnley During the Year 1922-23.

By W. C. Rugg, Chief Poultry Expert.

AN OFFICIAL WORLD'S RECORD.

The outstanding feature of the Twelfth Burnley Egg-laying Competition was the establishment of a new official world's record for a team of six Black Orpingtons for winter laying. This was done by Mr. W. Cullen's team, which, during 122 days, laid a total of 579 eggs, an average of 96½ per bird. The birds were a very even lot, of good size and type, and, after establishing a fine lead during the winter months, retained it during the whole competition, and thus became the winners in the Heavy Breeds—Wet Mash class. In addition, the team also won the prize offered for the pen the eggs of which realized the highest market value throughout the competition. The number of eggs which this team laid during the competition was 1,570, an average over 51 weeks of 261⅔ eggs per bird. The total number laid for the full twelve months was 1,602.

Mr. W. Cullen's Black Orpingtons—Winners in Class 3, Section A, with 1,602 eggs for twelve months.

This team also established an official World's Record for winter test, laying 579 eggs in 122 days.

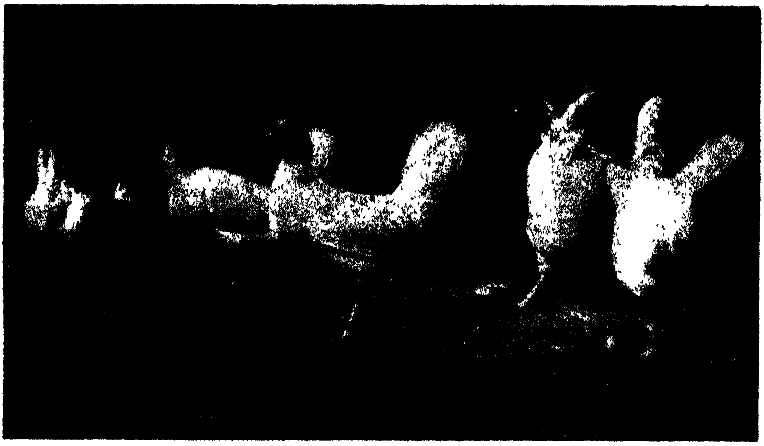
THE COMPETITION.

Owing to the Easter holidays commencing at the end of March, it was decided to close the competition a week earlier than usual, so that the competitors might be returned to their owners before the heavy holiday traffic commenced on the railways. The scores are, therefore, not for a full twelve months, but only for the period from 1st April, 1922, to 23rd March, 1923. The birds leading in each class were, however, retained for the full twelve months, and their scores for this period are shown in footnotes in the records on pages 428-432.

The total number of birds which competed in both sections of the competition was 594. The number entered in the different classes is shown hereunder:—

SECTION "A."—GROUPS OF SIX BIRDS.—TRAPNESTED.

Class 1, Light Breeds, Wet Mash	174 birds
Class 2, Light Breeds, Dry Mash	66 birds
Class 3, Heavy Breeds, Wet Mash . .	108 birds
Class 4, Heavy Breeds, Dry Mash	18 birds



Mr. A. Enticknap's White Leghorns—Winners in Dry Mash Class, with 1,609 eggs for twelve months.

SECTION "B."—INDIVIDUAL BIRDS—SINGLE TEST.

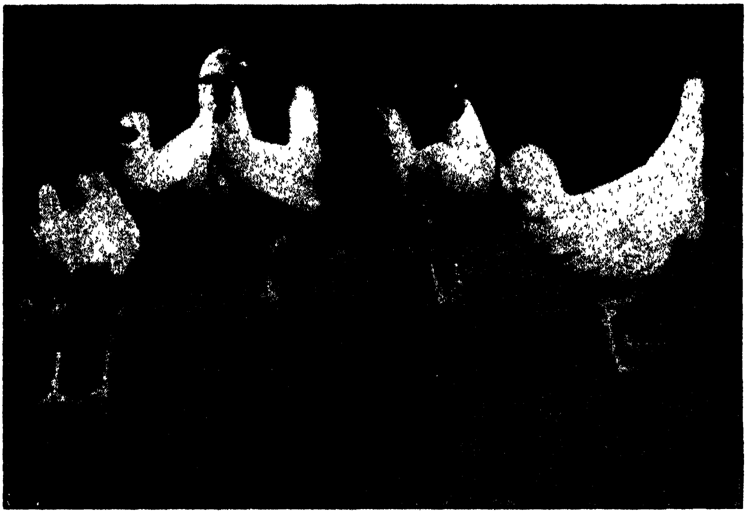
Class 1, Leghorns, Wet Mash	101 birds
Class 2, Leghorns, Dry Mash	46 birds
Class 3, All Light Breeds other than Leghorns, Wet Mash	6 birds
Class 4, Orpingtons, Any Colour, Wet Mash ...	57 birds
Class 5, All Heavy Breeds other than Orpingtons, Wet Mash	18 birds

Mr. W. A. Shevill was again to the fore, winning in the Dry Mash Class for Black Orpingtons, with a score of 1,443. The score for the twelve months (1,466) is only nine eggs less than his winning team in the Wet Mash Class last year. This breeder deserves special mention for the type and stamina of his birds, and the consistency of their laying qualities.

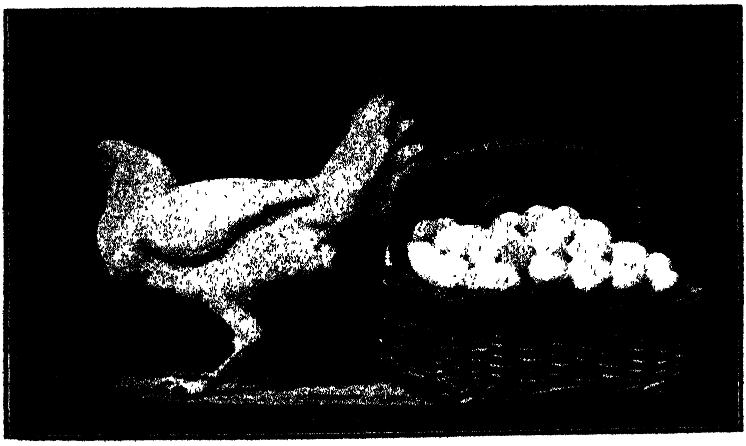
Mrs. T. Wilson won in the Wet Mash Class for Leghorns, with a score of 1,455 eggs. The score for the twelve months (1,478) is seven dozen eggs more than the winning team laid in the same class last year.

Mr. A. Enticknap again demonstrated the consistency of his strain, his birds winning the Light Breeds, Dry Mash Class, with a very fine total of 1,580 eggs. The score (1,609) for the twelve months shows a great improvement on his team's score in last year's competition, when they laid 1,541 eggs, finishing in second place. One of his birds in this year's team laid 309 during the twelve months.

In the Leghorn Classes for individual birds, Mr. W. Pert's hen in the Wet Mash Section laid 307, and Mr. G. McDonnell's hen in the Dry Mash laid 306. By the end of the twelve months honours were equally divided, each bird laying 313 eggs, which is a very creditable performance. This score was very nearly equalled by Mr. C. E. Graham's Black Orpington, which laid 312 eggs, and stopped laying on 24th March and went into a sudden and complete moult. This hen, Mr. Graham states, carries a quarter of the blood of "Record Queen," which established an official World's Record of 335 eggs in the 1917-18 Competition.



Mrs. T. Wilson's White Leghorns—Winners of Wet Mash Class—1,478 eggs for twelve months.



Mr. G. McDonnell's White Leghorn—Winner in Dry Mash Class, Single Test, with 313 eggs for twelve months.

Mr. H. Miller's Minorca won in Class 3, Section B, with a score of 220 eggs for 51 weeks. There is still room for improvement in this class.

The winner in Class 5, Rhode Island Red, was owned by Mr. W. Donovan. This was a bird of good type and colour, and laid 275 eggs during the competition and 280 in the full twelve months. This must be regarded as a first-class performance.

Mr. W. A. Shevill's Black Orpingtons—Winners of Class 4, Section A. Laid 1,466 eggs in twelve months

Mr. W. Pert's White Leghorn—Winner in Wet Mash Class, Single Test, with 313 eggs for the twelve months.

Eggs Laid Outside of the Trapnests.

The total number of eggs laid in the Trapnest Section was 74,844; and the percentage of eggs laid outside the trapnests was 1.18, which is very small, and reflects great credit on the watchfulness and care exercised by Mr. Macauley and his assistants.

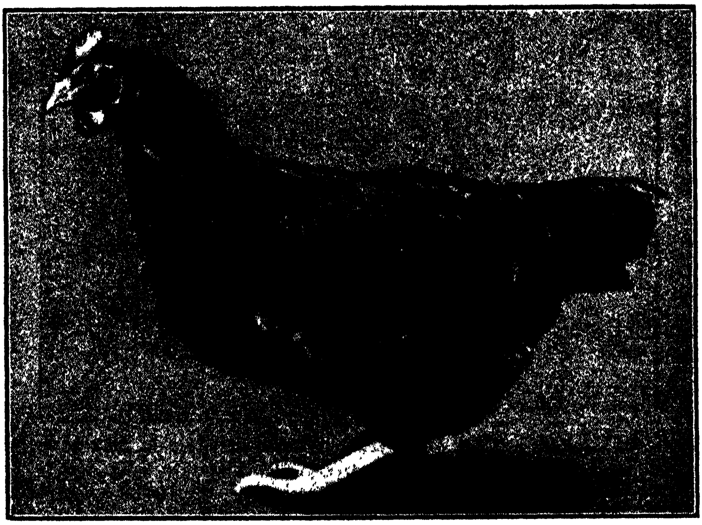
Improvements in Scores.

It will be noticed that the number of eggs laid by the winning birds this year was considerably in advance of those laid by the winners of the 1921-22 Competition, with one exception—that of Class 5, Section "B." In the Heavy Breed teams the improvement amounts to over 20 eggs per bird, and in the Light Breed teams to nearly 12 eggs per bird.

Feeding System.

A list of the different kinds and quantities of food fed to the birds during the currency of the competition is given hereunder. Its total cost was £380 3s. 8d.

Wheat	780	bushels
Oats	180	,,
Crushed Maize	50	,,
Pollard	547½	,,
Bran	365	,,
Pea Meal	2	cwt.
Meat (bullocks' heads and livers)	—	
Onions	7	,,
Salt	1	,,
Grit	2½	tons
Charcoal	20	bags



Mr. W. Donovan's Rhode Island Red—Winner of Class 5, Section B. Laid 280 eggs in twelve months.

It is worthy of note that, although the food used in this Competition was of the plainest description, there was a great improvement in the number of eggs laid by the winning birds.

The wet mash consisted of bran and pollard—equal parts by measure —mixed with soup made from bullocks' heads and livers; 20 per cent. chaffed green stuff was then added. During the last three months of the test, pea-meal was added to the mash at the rate of from 2½ per cent. to 5 per cent. Minced raw onions, at the rate of 2½ per cent. of the mash, was fed once a week. The dry mash consisted of equal parts, by measure, of bran and pollard. Three-quarters of an ounce of meat (minced livers and the meat off the bullocks' heads) was fed to each bird three times a week. Plenty of green stuff was fed to the birds daily.

The grain fed during the first half of the test was three parts wheat, two parts oats, one part crushed maize. In the summer the grain was three parts wheat, one part oats.

Grit and granulated charcoal were also available.

The Financial Side.

The total number of eggs laid during the Competition averaged 208½ eggs per bird.

Mr. C. E. Graham's Black Orpington—Winner of Class 4, Section B, with 312 eggs for twelve months.

(In the last week of the competition this bird suddenly went into a complete moult.)

The price realized for eggs averaged 1s. 9½d. per dozen during the year.

The cost of food averaged threepence per bird per week.

The return from the sale of eggs averaged £1 11s. 1¾d. per bird.

The cost of feed averaged 12s. 9½d. per bird.

Thus the profit over the cost of food for the year averaged 18s. 4¼d. per bird.

Comments on the Competition.

The general health of the birds was good throughout the Competition.

There is still room for improvement in both Heavy and Ligh Breeds. That Black Orpingtons can be bred of the right type an weight and still produce large quantities of eggs has been proved by the performance of the winning teams under both Dry and Wet Mash systems of feeding.

With White Leghorns the tendency is to breed them too small; they undoubtedly lay well, but that is not all that is wanted, if Victoria is to hold its place as the home of high-laying strains of White Leghorns. Poultrymen should see that no hen that is not of the correct size and type is put into their breeding-pens from which they intend breeding birds for next year's Competition.

Mr. H. Miller's Black Minorca—Winner in Class 3, Section B, with 220 eggs.

PRIZE LIST.

For the greatest total number of eggs laid by a pen in each Class of Sections "A" and "B":—

Section A.—Groups of Six Birds.—Trapnested.

Class 1.—Light Breeds.—Wet Mash.

1st Prize, Champion Certificate	Mrs. T. Wilson, 7 Murray-street, Brunswick W. (1,455 eggs).
2nd Prize, Government Certificate	Miss Brenda Clamp, Camp Hill Poultry Farm, Rosanna (1,429 eggs).
3rd Prize, Government Certificate	H. Groves, 5 Waterloo-street, Geelong West (1,391 eggs).

Class 2.—Light Breeds.—Dry Mash.

1st Prize, Champion Certificate	A. Enticknap, 216 High-street, Prahran (1,580 eggs).
2nd Prize, Government Certificate	Norman Meyers, Queens-avenue, Caulfield (1,414 eggs).
3rd Prize, Government Certificate	Chas. Ridley, "Maplecroft," Auburn-avenue, Northcote (1,401 eggs).

Class 3.—Heavy Breeds.—Wet Mash.

1st Prize, Champion Certificate	W. Cullen, Closer Settlement, Werribee (1,570 eggs).
2nd Prize, Government Certificate	Deepspring Poultry Farm (R. W. Shellard), Daylesford (1,463 eggs).
3rd Prize, Government Certificate	Wingood Poultry Yard (Theo. A. Goodwin), 8 Peel-street, Kew (1,449 eggs).

Class 4.—Heavy Breeds.—Dry Mash.

1st Prize, Champion Certificate	W. A. Shevill, Reserve-road, Beaumaris (1,443 eggs).
2nd Prize, Government Certificate	A. Siede & Sons, Highett Poultry Farm, Point Nepean-road, Highett (1,363 eggs).
3rd Prize, Government Certificate	Marville Poultry Farm (A. H. Dumaresq), South-road, Moorabbin (1,048 eggs).

Section B.—Individual Birds.—Trapnested.

Class 1.—Leghorns.—Wet Mash.

1st Prize, Champion Certificate	W. Pert, 11 Elizabeth-street, Newport (307 eggs).
2nd Prize, Government Certificate	J. G. Alston (Belle Vue Egg Farm), Dundas-street, Thornbury (285 eggs).
3rd Prize, Government Certificate	A. Siede & Sons, Highett Poultry Farm, Point Nepean-road, Highett (278 eggs).

Class 2.—Leghorns.—Dry Mash.

1st Prize, Champion Certificate	G. McDonnell, 150 Camberwell-road, Auburn (306 eggs).
2nd Prize, Government Certificate	A. A. Smith, Harriet-street, North Croydon, South Australia (300 eggs).
3rd Prize, Government Certificate	W J. Anderson, "Aston," David-road, Hampton (290 eggs).

Class 3.—All Light Breeds other than Leghorns.—Wet Mash.

1st Prize, Champion Certificate	H. Miller, 64 Childers-street, East Kew (220 eggs).
2nd Prize, Government Certificate	G. E. Andrew, Spring-road, Ormond (215 eggs).
3rd Prize, Government Certificate	Montuna Poultry Farm (Luke Bros.), Beaconsfield (186 eggs).

Class 4.—Orpingtons, any colour.—Wet Mash.

1st Prize, Champion Certificate	C. E. Graham, Portarlington (312 eggs).
2nd Prize, Government Certificate	W. Cullen, Closer Settlement, Werribee (267 eggs).* R. R. Cochran, 186 St. Kilda-street, Middle Brighton (267 eggs).*

* Equal for second place.

Class 5.—All Heavy Breeds other than Orpingtons.—Wet Mash.

1st Prize, Champion Certificate	W. Donovan, 24 Regent-street, Middle Brighton (275 eggs).
2nd Prize, Government Certificate	All Red Poultry Farm (S. C. Handley) Burrowby, Dandenong (247 eggs).
3rd Prize, Government Certificate	McCormack & Kinzel, 5 Wigton-street, Ascot Vale (246 eggs).

For the greatest total number of eggs laid by individual birds in each Class of Section "A' :—

Class 1.—Light Breeds—Wet Mash.

1st Prize, Champion Certificate	.. H. Williams, 59 Stephen-street, Yarraville (268 eggs).
2nd Prize, Government Certificate	.. J. S. Buchan, Seaton Park, South Australia (264 eggs).
3rd Prize, Government Certificate	.. Mrs. T. Wilson, 7 Murray-street, Brunswick West (263 eggs).

Class 2.—Light Breeds.—Dry Mash.

1st Prize, Champion Certificate	.. A. Enticknap, 216 High-street, Prahran (303 eggs)
2nd Prize, Government Certificate	.. A. Enticknap, 216 High-street, Prahran (266 eggs).
3rd Prize, Government Certificate	.. Norman Meyers, Queen's-avenue, Caulfield (265 eggs).

Class 3.—Heavy Breeds.—Wet Mash.

1st Prize, Champion Certificate	.. Wingood Poultry Yard (Theo. A. Goodwin), 8 Peel-street, Kew (293 eggs)
2nd Prize, Government Certificate	. W. Cullen, Werribee Poultry Farm (289 eggs).
3rd Prize, Government Certificate	.. A. Siede, 97 Stawell-street, Burnley (278 eggs).

Class 4.—Heavy Breeds.—Dry Mash.

1st Prize, Champion Certificate	.. W. A. Shevill, Reserve-road, Beaumaris (277 eggs).
2nd Prize, Government Certificate	. Marville Poultry Farm (A. H. Dumaresq), South-road, Moorabbin (255 eggs).
3rd Prize, Government Certificate	.. A. Siede & Sons, Highett Poultry Farm, Point Nepean-road, Highett (254 eggs).

For the pen which shows the greatest average weight per dozen eggs laid:—

Section A.—Groups of Six Birds.—Trapnested.

1st Prize, Government Certificate	.. A. Siede, 97 Stawell-street, Burnley (26·092 ozs. per dozen).

For the pen the eggs of which realized the highest market value throughout the competition:—

Section A.—Groups of Six Birds.—Trapnested.

1st Prize, Government Certificate	**.. W. Cullen, Werribee Poultry Farm, 1,570 eggs; value, £11 16s. 5½d.**

FINAL RESULTS.

SCORES OF ALL COMPETING BIRDS.

(The letter *d* denotes that the bird died during the competition. The column (x) indicates the number of eggs laid outside nest.)

Section A.—Groups of Six Birds Trapnested.

Pen No	Competitor.	Hen.							Total to 23rd March, 1923
		1.	2.	3.	4.	5	6.	(x).	
	Class 1.—Light Breeds, Wet Mash (White Leghorns).								
5	Mrs. T. Wilson .	247	252	223	237	(*d*) 221	263	12	1,455*
17	Miss B. Clamp .	250	253	241	221	241	218	5	1,429
11	H. Groves .	262	199	248	232	234	212	4	1,391
23	W. Vercoe ..	256	242	233	258	(*d*) 184	175	19	1,367
10	W. Cullen .	217	216	232	230	230	224	14	1,363
12	Herbert Bros. ..	247	202	251	219	225	201	7	1,352
1	G. Pocknall ..	231	234	221	196	229	181	15	1,307
25	S. C. Handley .	128	254	246	224	238	194	13	1,297
27	Claud Langley .	251	197	226	225	218	171	5	1,293
6	Norman Meyers	186	251	216	218	207	200	5	1,283
8	G. McDonnell .	258	245	239	(*d*) 82	210	197	7	1,238
30	H. Holmes	236	176	213	227	199	177	1	1,229
9	H. Schmutter	219	204	217	147	218	217	3	1,225
26	Wanchai Poultry Farm	(*d*) 43	233	(*d*) 187	258	245	242	14	1,222
21	J. S. Buchan ..	218	(*d*) 188	264	193	194	151	4	1,212
28	Deepspring Poultry Farm ..	209	190	198	186	195	220	4	1,202
15	Braeside Poultry Farm ..	176	195	202	173	215	213	13	1,187
22	Alf. Canning ..	(*d*) 9	194	219	243	260	237	22	1,184
20	E. A. Lawson ..	199	208	203	186	197	185	2	1,180
14	Montuna Poultry Farm	148	241	207	208	219	109	37	1,169
19	D. Gibson ..	228	(*d*) 152	198	(*d*) 230	(*d*) 184	147	11	1,150
16	Alf. E. Jenkins ..	171	191	149	235	171	218	..	1,135
24	H. Williams .	120	220	80	209	215	268	9	1,121
7	A. Minter ..	198	171	165	197	187	178	3	1,099
2	A. Scott ..	82	207	192	171	178	192	20	1,042
13	J. H. Chirnside ..	198	189	173	211	18	212	8	1,009
4	Mrs. S. Lampert .	211	216	189	162	166	(*d*) 29	7	980
18	G. B. Brown and Son	187	161	187	200	150	42	18	945
3	D W. Ilton ..	132	134	140	160	123	187	3	879
	Class 2.—Light Breeds, Dry Mash (White Leghorns).								
32	A. Enticknap ..	303	244	254	266	226	257	30	1,580*
37	Norman Meyers .	234	265	260	219	168	240	28	1,414
40	Chas. Ridley .	234	204	233	233	245	249	3	1,401
38	Montuna Poultry Farm ..	238	195	256	240	198	239	10	1,376
35	Claud Langley ..	226	210	243	141	233	237	10	1,300
34	Cores Stud ..	183	203	201	210	236	250	2	1,285
41	Miss M. T. Kidd ..	191	242	191	198	203	231	24	1,280
36	J. B. Nicoll ..	162	244	207	198	209	211	13	1,244
31	G. McDonnell ..	137	(*d*) 150	247	238	254	159	11	1,196
33	P. N. Tilley ..	194	177	(*d*) 165	203	195	201	17	1,152
39	A. McCall ..	249	149	196	103	213	163	9	1,082

* Birds remained till 31st March, eggs laid in twelve months, 1,478.

* Birds remained till 31st March; eggs laid in twelve months, 1,609.

FINAL RESULTS—*continued.*

SECTION A.—GROUPS OF SIX BIRDS TRAPNESTED—*continued.*

Class 3.—Heavy Breeds, Wet Mash (Black Orpingtons, except Pen 49, Langshans).

Pen No.	Competitor.	Hen. 1.	2.	3.	4.	5.	6	(x).	Total to 23rd March, 1923.
59	W. Cullen ..	289	271	271	235	245	253	6	1,570*
47	Deepspring Poultry Farm ..	233	214	243	252	249	261	11	1,463
46	Wingood Poultry Yard ..	293	200	260	181	267	234	14	1,449
50	Herbert Bros. ..	61	246	215	241	272	227	28	1,290
56	R. R. Christie ..	244	210	204	248	121	(*d*) 221	7	1,255
63	Frank Harrison ..	196	203	186	203	196	233	31	1,248
51	G. B. Brown and Son	180	228	165	208	213	233	8	1,235
58	J. Quinlan .	227	202	176	228	152	226	13	1,224
62	Mrs. S. Lampert ..	81	219	216	264	(*d*) 223	195	26	1,224
61	C. E. Graham ..	241	229	160	(*d*) 179	(*d*) 118	259	22	1,208
49	A. Siede ..	175	189	179	173	182	278	17	1,193
55	Marville Poultry Farm ..	269	217	218	229	(*d*) 36	189	8	1,166
45	A. Siede and Sons	153	198	193	202	211	202	4	1,163
44	W. A. Shevill ..	216	151	215	129	217	175	38	1,141
43	Wanchai Poultry Farm ..	87	187	156	168	229	219	13	1,059
53	A. McCall ..	132	161	118	240	171	190	22	1,034
52	Invicta Poultry Farm ..	155	153	150	154	187	133	34	966
60	S. Andrew ..	123	64	239	154	52	148	67	847

* Birds remained till 31st March; eggs laid in twelve months, 1,602

Class 4.—Heavy Breeds, Dry Mash (Black Orpingtons).

Pen No.	Competitor.	Hen. 1.	2.	3.	4.	5.	6	(x).	Total to 23rd March, 1923.
68	W. A. Shevill ..	234	246	222	277	219	231	14	1,443*
67	A. Siede and Sons	194	211	223	254	231	230	20	1,363
66	Marville Poultry Farm ..	192	(*d*) 11	226	122	255	201	41	1,048

* Birds remained till 31st March; eggs laid in twelve months, 1,466.

Section B.—Individual Birds.

Class 1.—Leghorns, Wet Mash (White Leghorns).

Pen No.	Competitor.	Total to 23rd March, 1923.	Pen No	Competitor	Total to 23rd March, 1923
212	W. Pert	307*	171	W. L. Caspar .. .	262
150	A. Siede and Sons ..	278	144	T. L. Eastaugh ..	259
138	A. A. Smith	276	177	Wm. Vercoe . ..	258
191	H. Hanbury	273	165	Ceres Stud	257
211	W. Pert	269	193	Avondale Poultry Farm..	256
141	G. McDonnell	263	219	Herbert Bros.	254

* Bird remained till 31st March; eggs laid in twelve months, 313

FINAL RESULTS—*continued.*

SECTION B.—INDIVIDUAL BIRDS—*continued.*

Pen No.	Competitor.	Total to 23rd March, 1923.	Pen No.	Competitor.	Total to 23rd March, 1923.
	CLASS 1.—LEGHORNS, WET MASH—*continued.*				
176	W. Godden	254	209	A. O. Clifford	231
207	Homerton Stud Farm	250	178	Wm. Vercoe	228
226	Deepspring Poultry Farm	247	161	R. E. Exelby	227
173	Alf. Canning	244	160	Norman Meyers	226
179	G. G. Stud Farm	243	164	Mrs. S. Lampert	222
188	M. G. Leech	242	143	T. L. Eastaugh	219
225	Deepspring Poultry Farm	240	170	C. Duke	218
159	Norman Meyers	240	169	C. Duke	216
236	Brown Bros.	239	233	Montuna Stud Poultry Farm	214
190	F. McKenzie	239			
172	W. L. Caspar	239	189	F. McKenzie	213
184	T. A. Pettigrove	238	182	R. R. Christie	212
180	G. G. Stud Farm	235	215	G. F. Walbran	207
221	G. E. Andrew	234	139	C. Ridley	207
224	La Galle's Poultry Farm	233	202	L. F. Bush	203
235	Brown Bros.	232	152	G. McCutchan	202
222	G. E. Andrew	229	158	R. E. Palmer	199
195	T. J. Stevens	227	228	G. Wilkinson	196
186	J. G. Alston	285	168	G. W. Stagg	191
199	J. H. Duncan	276	156	F. Crafts	185
136	Claud Langley	276	153	H. C. Clark	158
145	W. Cullen	273	210	A. O. Clifford	131
216	G. F. Walbran	266	220	Herbert Bros.	118
135	Claud Langley	263	218	C. Middleton	(*d*) 57
200	J. H. Duncan	260	227	G. Wilkinson	(*d*) 17
230	Tatham Hurst	258	174	Alf. Canning	225
231	Blackrock Poultry Farm	257	198	A. R. Boothman and Son	221
148	F. Wight	257	197	A. R. Boothman and Son	218
146	W. Cullen	255	166	Ceres Stud	217
187	M. G. Leech	254	154	H. C. Clark	215
196	T. J. Stevens	253	201	L. F. Bush	214
140	C. Ridley	248	203	L. K. Palmer	212
217	C. Middleton	247	142	G. McDonnell	212
167	G. W. Stagg	244	204	L. K. Palmer	207
214	Woorayl Poultry Farm	242	223	La Galle's Poultry Farm	205
151	G. McCutchan	242	183	T. A. Pettigrove	202
194	Avondale Poultry Farm	240	206	J. S. Mills	199
137	A. A. Smith	240	157	R. E. Palmer	199
229	Tatham Hurst	239	162	R. E. Exelby	192
175	W. Godden	239	163	Mrs. S. Lampert	188
213	Woorayl Poultry Farm	238	232	Blackrock Poultry Farm	164
205	J. S. Mills	236	149	A. Siede and Sons	157
234	Montuna Poultry Farm	234	147	F. Wight	124
181	R. R. Christie	234	155	F. Crafts	(*d*) 65
185	J. G. Alston	233	192	H. Hanbury	(*d*) 47
	Class 2.—Leghorns, Dry Mash (White Leghorns).				
131	G. McDonnell	306*	101	H. W. Smith	278
128	W. J. Anderson	290	102	H. W. Smith	269
129	Homerton Stud Farm	287	97	G. F. Walbran	265
117	Norman Meyers	282	111	R. R. Christie	261

* Bird remained till 31st March; eggs laid in twelve months, 318.

FINAL RESULTS—*continued.*

SECTION B.—INDIVIDUAL BIRDS—*continued.*

CLASS 2.—LEGHORNS, DRY MASH (WHITE LEGHORNS)—*continued.*

Pen No.	Competitor.	Total to 23rd March, 1923.	Pen No.	Competitor.	Total to 23rd March, 1923.
121	J. G. Alston	(*d*) 257	100	Claud Langley	276
99	Claud Langley	256	114	P. N. Tilley	267
120	Montuna Poultry Farm	251	119	Montuna Poultry Farm	263
106	Herbert Bros.	248	112	R. R. Christie	259
93	T. A. Pettigrove	248	125	Ceres Stud	256
89	F. Wight	247	116	Blackrock Poultry Farm	252
104	G. McCutchan	244	94	T. A. Pettigrove	251
130	Homerton Stud Farm	233	98	G. F. Walbran	248
133	A. A. Smith	217	126	Ceres Stud	247
113	P. N Tilley	214	107	W. White	244
115	Blackrock Poultry Farm	206	124	G. Wilkinson	241
103	G. McCutchan	191	92	J. H. Duncan	230
109	A. R. Boothman and Son	189	96	I. Maynard	217
123	G. Wilkinson	158	95	I. Maynard	214
122	J. G. Alston	117	105	Herbert Bros.	206
134	A. A. Smith	300	90	F. Wight	190
91	J. H. Duncan	289	127	W. J. Anderson	165
118	Norman Meyers	283	108	W. White	151
132	G. McDonnell	279	110	A. R. Boothman and Son	(*d*) 20

Class 3.—All Light Breeds other than Leghorns, Wet Mash (Anconas, Pens 85, 86, 87, 88; Minorcas, 83, 84).

84	H. Miller	220	85	G. E. Andrew	215
87	Montuna Poultry Farm	186	86	G. E. Andrew	160
83	H. Miller	99	88	Montuna Poultry Farm	(*d*) 51

Class 4.—Orpingtons, Any Colour, Wet Mash (Black Orpingtons).

56	C. E. Graham	312*	79	Marville Poultry Farm	170
53	R. R. Cochran	267	42	Cypress Poultry Farm	(*d*) 161
40	J. Mooney	261	35	Mrs. S. Lampert	156
61	J. C. Mickelburough	255	64	Blackrock Poultry Farm	149
33	C. C. Dunn	252	25	M. G. Leech	(*d*) 136
29	H. G. Lawrance	249	43	A. Clements	(*d*) 121
39	J. Mooney	245	78	G. Dwyer	95
38	R. R. Christie	236	72	A. Siede and Sons	(*d*) 1
82	G. E. Andrew	233	60	W. Cullen	267
70	S. Andrew	232	67	Woorayl Poultry Farm	262
37	R. R. Christie	220	57	F. W. Gough	256
45	Geo. Lauchlan	216	77	G. Dwyer	252
52	D. Gibson	211	51	D. Gibson	249
55	C. E. Graham	204	73	N. Pearson	247
46	Geo. Lauchlan	(*d*) 197	62	J. C. Mickelburough	243
58	F. W. Gough	195	48	A. O. Clifford	234
36	Mrs. S. Lampert	188	81	G. E. Andrew	233
44	A. Clements	186	80	Marville Poultry Farm	225
59	W. Cullen	182	68	Woorayl Poultry Farm	219
69	S. Andrew	176	31	Andrew Baker	215
34	C. C. Dunn	175	26	M. G. Leech	(*d*) 205

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* Bird remained till 31st March; eggs laid in twelve months, 312.

FINAL RESULTS—*continued.*

SECTION B.—INDIVIDUAL BIRDS—*continued.*

CLASS 4.—ORPINGTONS, ANY COLOUR, WET MASH—*continued.*

Pen No.	Competitor	Total to 23rd March, 1923.	Pen No.	Competitor.	Total to 23rd March, 1923.
65	A. G. Stevens	197	23	T. L. Eastaugh ..	170
76	Roy Sanders	195	32	Andrew Baker ..	(*d*) 158
71	A. Siede and Sons ..	194	50	E. Ross	151
74	N. Pearson	186	49	E. Ross	137
54	R. R. Cochran ..	183	41	Cypress Poultry Farm ..	134
24	T. L. Eastaugh ..	180	27	Deepspring Poultry Farm	121
63	Blackrock Poultry Farm	176	47	A. O. Clifford	(*d*) 18
30	H. G. Lawrance ..	171			

Class 5.—All Heavy Breeds other than Orpingtons, Wet Mash.

Pen No.	Competitor	Breed.	Total to 23rd March, 1923.	Pen No.	Competitor.	Breed.	Total to 23rd March, 1923.
14	W. Donovan ..	R.I.R.	275*	19	Kreira Poultry Farm	R.I.W.	211
7	All Red Poultry Farm	,,	247	9	A. Siede ..	Langshan	202
4	McCormack and Kinzell	,,	246	12	C. C. Dunn ..	,,	202
20	Kreira Poultry Farm	R.I.W.	244	13	W. Donovan ..	R.I.R.	199
8	All Red Poultry Farm	R.I.R.	225	17	L. Faulkner ..	,,	197
15	Sunny Crest Farms	,,	223	3	McCormack and Kinzell	,,	190
1	H. Miller ..	R.I.W.	222	2	H. Miller ..	R.I.W.	186
18	L. Faulkner ..	R.I.R.	213	16	Sunny Crest Farms	R.I.R.	159
				10	A. Siede ..	Langshan	(*d*)124
				11	C. C. Dunn ..	,,	94

* Bird remained till 31st March; eggs laid in twelve months, 280.

* * *

SHEEP DIPPING.

EFFECT OF COMPULSORY DIPPING IN VICTORIA.

(*By A. W. Curlewis, Stock Inspector.*)

It may be of interest to draw attention to the great improvement noted in recent years in the condition of sheep yarded at Newmarket, and generally throughout the State, so far as the freedom from ticks and lice is concerned. It is probable that, prior to dipping being made compulsory about twelve years ago, not more than some three-fifths to three-fourths of the sheep shorn in Victoria each year were dipped. As far back as 1880, experienced sheep-owners, notably in the Western District, had recognised the value of dipping to eradicate or check ticks and lice, and the practice had become almost general with such sheep-owners. But, amongst the increasing numbers of comparatively small and inexperienced owners, many did not realize the importance of dipping, the benefits of which increased in proportion to the higher value of sheep and wool, and the effect of a percentage of sheep, and particularly late lambs not marketed as fat, remaining undipped throughout the State, to some extent nullified the effort of careful owners to keep their sheep free from vermin.

It is impracticable to estimate the monetary gain accruing through careful and consistent dipping, but from the experience of various owners and details given from time to time by wool-brokers, &c., it can safely be assumed that the increased annual productiveness through the more thriving condition of sheep and lambs and increase in weight and value per pound of the clip, may be estimated at least from £12 10s. to £15 per 100 sheep.

On this subject it is interesting to note the strong advocacy for dipping in the pages of that very practical and useful book, *Sheep Farm and Station Management*, compiled by E. H. Pearse and published by the Pastoral Review Proprietary Limited, in which appears the following:—

> "Dipping, if the proper materials are used and the work is properly done, is one of the most valuable investments that any owner of sheep can make, and is beneficial alike to the condition and the growing fleece of the animal. . . .
>
> "Given a good, reliable and proved dip of present-day manufacture properly prepared and efficiently used, there need be no fear of the wool being injured in any of the ways described."

Bearing this out, a very high authority may be quoted in Mr. S .B. Hollings, the well-known Bradford wool expert, who says:—

> "I hasten to combat such a silly notion as that dipping produces light fleeces. . . . I have never yet known a single case where a good proprietary dip, particularly of the arsenical class, was used, that it had not had a wholesome and beneficial effect upon the skin, and I cannot for the life of me understand such a dip causing a growth of light fleece."

Though not claiming that *all* the sheep shorn in Victoria *are* dipped in accordance with the Act, and being fully aware that many owners do not take the care in the operation that they should, I repeat that the distinct improvement is encouraging.

When I first began to make inspections of sheep under the Sheep Dipping Act, it was very common from this time of the year (April) up to shearing time to find a large number of the small lines of store sheep yarded at a sale carrying ticks or lice—a percentage of these infested with the latter pest showing the damage done to the fleece through the sheep rubbing and plucking until the flanks and portion of the ribs were almost bare of wool.

In view of the fact that the drought of 1914-15—the effect of which was felt early in the northern parts of the State—checked dipping for that year (the Sheep Dipping Act being practically suspended there for the season), and that in the year 1919-20 numbers of sheep went undipped through scarcity of water in parts of the north, and that both these periods of relaxed effort meant a severe set-back for the results of more general dipping, it may, I think, be claimed that the Sheep Dipping Act has gone far to fulfil its purpose.

FRUIT INDUSTRY OF VICTORIA.

Its Present Status and Future Outlook, &c.

PART III.

(Continued from page 116.)

By E Meeking, Senior Fruit Inspector

In concluding the last article, it was mentioned that details would next be given of (*a*) pre-war and present cost of establishing and maintaining a 20-acre orchard; (*b*) rail freights; (*c*) local distribution costs in the metropolitan markets; (*d*) facilities which exist in the metropolitan market for sale and distribution of fruit.

Before dealing with these matters, however, it would be preferable to make a further analysis of production by quoting the latest figures obtainable of the acreage planted out to fruit.

The figures are given hereunder in three statements, No. 1 showing the total acreage, both bearing and non-bearing, throughout the Commonwealth; No. 2 the non-bearing acreage alone; and No. 3 the percentage of non-bearing to bearing acreage in apples, apricots, bananas, cherries, lemons, oranges, peaches, pears, and plums (the nine principal kinds of fruit grown). By this means, readers will be informed, not only regarding the acreage of the different fruits in Victoria, as against the Commonwealth total, but will be enabled to realize the varieties of fruit in which the greatest increases are likely to eventuate within the next few seasons in each State of the Commonwealth.

An analysis of No. 1 table shows that Victoria has the largest total area under fruit in the Commonwealth, and for many individual varieties is well in the lead. This is particularly noticeable with respect to apples, the fruit most extensively grown in Australia. Apple-growing constitutes nearly 50 per cent. of the total fruit grown in the Commonwealth, and of this quantity Victoria grows 33.94 per cent. It will perhaps surprise many unacquainted with the facts to know that the acreage under apples in Victoria exceeds that of Tasmania.

Oranges come next to apples in order of acreage devoted to cultivation, the total for the Commonwealth being 41,020 acres. Of this acreage, 60.09 per cent. is in New South Wales; Victoria, Queensland, South Australia each has an acreage of slightly over 10 per cent., while in Western Australia it is slightly over 7 per cent.

Thirty thousand and ninety-four acres are devoted to peach production throughout the Commonwealth, and about 42 per cent. of this acreage is in Victoria, and somewhat over 36 per cent. in New South Wales.

Of the 23,194 acres given over to pear production in Australia, Victoria is far in the lead of the other States, having an area of nearly 53 per cent. of this total; New South Wales has second place with 19½ per cent.

Plums come next in order of importance with a total Commonwealth area of 17,251 acres. Victoria is again in the lead with 36.42 per cent., New South Wales being a close second with 34.82 per cent.

Of the total of 6,899 acres devoted to lemon-growing, New South Wales is far in the lead with 52.55 per cent., or approximately twice the area in Victoria which comprises 26.13 per cent.

Regarding statements No. 2 and No. 3, it will be noticed that the non-bearing acreage in apples comprises 22.66 per cent. of the total area under this fruit, and that of this area the largest proportion is in Victoria, where it is 38.76 per cent. of the total.

In apricots, 22.93 per cent. of the Commonwealth total is non-bearing, and 33.43 per cent. of this is in Victoria.

The figures for bananas show that practically only two States, viz, Queensland and New South Wales, grow this class of fruit, the only other State where any are grown being Western Australia, and here the quantity is only .11 of the total. Of the total acreage under bananas, 60.89 is in Queensland, and 38.98 in New South Wales. Of the non-bearing area, however, which comprises 12.47 of the total, 99.6 per cent. is in New South Wales. This is accounted for by the large plantings which have taken place within recent years along the north-eastern coast districts of that State.

New South Wales leads in the total area under cherries (43.28 per cent.), and also in the non-bearing acreage of this fruit, having 65.59 per cent. of the total, or considerably more than half of that of the whole Commonwealth. As the non-bearing acreage in the Commonwealth comprises 24.35 of the total, it indicates that in New South Wales heavy plantings of this class of fruit have recently been carried out.

The non-bearing area of lemons comprises 28.84 per cent. of the total, and here again, New South Wales, which leads in the total area under lemons, is ahead in the non-bearing acreage, with 46.89 per cent. of the total.

In oranges, New South Wales is by far the leading State with 60.09 per cent. of the total, and is also well in the lead in the non-bearing area with 54.15 per cent. of the total for the Commonwealth.

Victoria, which leads in the area under peaches (42.36 per cent.) is also in the lead in the non-bearing area with 44.84 per cent. of the total, indicating that an increase in peach production may be expected here in the next few years.

Of the area planted out to pears, Victoria has a percentage of 52.95 per cent., and in the non-bearing percentage, is also well in the lead with 51.18 per cent. of the total.

Victoria also leads in the total area under plums (36.42 per cent.), but in the non-bearing area, New South Wales has 54.09 per cent. of the total. As the non-bearing area of plums represents the high percentage of 37.97 per cent. of the total area (bearing and non-bearing), and as 54.09 per cent. of this non-bearing area is in New South Wales; and as, further, the total area of bearing and non-bearing in New South Wales comprises 34.82 per cent. of the Commonwealth total, it indicates that very heavy plantings of plums have taken place in that State in recent years. This is probably accounted for by the heavy planting of prunes in the irrigation areas.

Summarized, the statements seem to indicate that, from the point of view of quantities, the heaviest increases in the immediate future will be as follow:—

> Plums, New South Wales, pears, Victoria, apples, Victoria; peaches, Victoria and New South Wales; oranges, New South Wales; apricots, Victoria; cherries, New South Wales; lemons, New South Wales.

If any readers wish to arrive at the actual acreage in figures (either bearing or non-bearing or both), they may do so by working out the percentages shown in the statements.

Table No. 1.

Showing total area under bearing and non-bearing fruit trees in the Commonwealth, and the percentage of each kind in the several States for the year 1920-21.

(Total Area—Bearing and Non-Bearing for Commonwealth 275,020 acres.)

Fruit.	Commonwealth Total.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.
	acres.	%	%	%	%	%	%
Apples ..	103,334	13·18	33·94	3·23	10·77	10·1	28·76
Apricots .	13,277	14·54	40·46	·88	23·2	5·15	15·74
Bananas ..	14,748	38·98	..	60·89	..	·11	.
Cherries ..	6,517	43·28	41·09	·26	12·72	..	2·63
Custard Apples ..	185	..	.	100·	..	..	..
Figs ..	1,360	7·5	36·69	1·1	20·88	33·82	..
Lemons ..	6,899	52·55	26·13	5·13	8·23	7·94	..
Mangoes ..	292	·34	..	99·65	.	..	.
Nectarines	1,250	44 4	17·76	18·	.	19·84	
Oranges ..	41,020	60·09	10·91	10·27	10·92	7·78	.
Passion Fruit	138	..	62·31	37·68	..	..	.
Pineapples	3,956	1·18	..	98·8	..	..	..
Paw Paws..	209	..	..	100·	..	..	..
Peaches .	30,094	36·31	42·36	6·73	10·63	3·61	·33
Pears ..	23,194	19·56	52·95	1·32	10·49	6·18	9·48
Persimmons	216	84·72	3·7	11·57	..	..	..
Plums .	17,251	34·82	36·42	4·93	14·46	5·14	4·2
Quinces ..	2,511	16·36	60·69	2·82	11·35	4·57	4·38
Raspberries	1,390	..	17·05	..	6·69	..	76·25
Strawberries	487	1·02	36·75	21·97	20·32	4·51	15·4
Other Small n.e.i ..	1,683	4·04	39·69	·41	3·5	7·54	44·8
Other Citrus n.e.i. ..	189	83·59	..	10·05	6·34	..	..
All other n.e.i. ..	4,820	3·67	65·33	15·26	9·26	6·45	..
	275,020						

TABLE NO. 2.

Showing percentage of area under non-bearing fruit trees in the Commonwealth, and the percentage of each kind in the several States for the year 1920-21.

Commonwealth Total Area Under Non-Bearing Trees.—63,502 Acres.

Fruit.	Commonwealth Total.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.
	acres.	%	%	%	%	%	%
Apples ..	23,421	18·94	38·76	5·52	9·72	9·46	17·56
Apricots ..	3,045	19·6	33·43	..	20·09	6·23	20·62
Bananas ..	1,840	99·6	..	..	..	·38	..
Cherries ..	1,584	65·59	23·23	..	9·84	.	1·32
Custard Apples ..	..	..	..	.	..	..	
Figs .	299	15·05	41·8	..	16·05	27·09	.
Lemons .	1,981	46·89	32·05	..	7·11	13·93	..
Mangoes ..	33	..	..	100·	..	..	
Nectarines	195	69·23	3·58	..	..	27·17	
Oranges ..	10,139	54·14	9·02	12·55	13·75	10·51	..
Passion Fruit	31	..	100·	..	..	..	..
Pineapples	22	100·	..	..	..	.	..
Paw Paws..	..	..	.	..	..	..	.
Peaches	5,994	40·42	44·84		11·34	2·93	·45
Pears ..	7,237	24·34	51·18	..	10·34	5·38	8·73
Persimmons	43	93·02	6·97	..	..	..	..
Plums ..	6,551	54·09	27·04	..	12·66	2·79	3·38
Quinces ..	766	15·92	72·06	..	6·	2·61	3·39
Raspberries	5	..	..	..	100·	..	
Strawberries	..	..	..	..	..	..	..
the Small n.e.i. ..	60	81·66	11·66	..	6·66	.	.
Other Citrus n.e.i. ..	29	89·65	..	..	10·34	..	..
All other n.e.i.	227	21·58	6·6	·44	14·09	57·26	..
	63,502						

TABLE NO. 3.

Showing percentages of non-bearing areas of apples, apricots, bananas, cherries, lemons, oranges, peaches, pears, and plums, in relation to total areas (bearing and non-bearing) under those fruits in the Commonwealth 1920-21.

Fruit.	Commonwealth Totals.		Percentage of non-bearing to total area.
	Bearing and non-bearing.	Non-bearing only.	
	acres.	acres.	
Apples	103,334	23,421	22·66
Apricots . ..	13,277	3,045	22·93
Bananas	14,748	1,840	12·47
Cherries	6,517	1,584	24·30
Lemons	6,899	1,981	28·71
Oranges	41,020	10,139	24·71
Peaches	30,094	5,994	19·91
Pears	23,194	7,237	31·20
Plums	17,251	6,551	37·97

(*To be continued.*)

WEEDS AND THEIR ERADICATION.

(Continued from page 360.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Bartsia latifolia, Sibth. Family: *Scrophulariaceæ*.

This common weed of the roadside and poorly-grassed lands, although small, is rendered conspicuous and easy of recognition by reason of its numerous spikes of small purplish-red flowers. (Figure 66.) While not a proclaimed weed, *Bartsia* is exceedingly plentiful, some years especially so, as it seeds very freely.

It appears to favour the poorer quality of land, where it has little or no competition from grasses, so that any system of treatment, such as top-dressing of pastures, &c., that will improve soil conditions, tends to make the competition too severe for this and many other undesirable plants, as they are soon crowded out by the better-class herbage

This *Bartsia* hails from the Mediterranean region, from where so many other troublesome weeds have come. Probably it first reached here as an impurity in seed.

Common Chamomile, *Anthemis nobilis*, L. Family: *Compositæ*

The stems of this plant are more prostrate than those of the proclaimed plant Stinking Mayweed, *Anthemis Cotula*, L. *A. nobilis* has valuable tonic properties, but its bitterness makes it an undesirable, owing to the taint it imparts to the milk of dairy cows having access to it.

The leaves of *A. nobilis* (Figure 67) are smaller than those of *A. Cotula*; it also has a much more pleasant smell than the latter plant Both species have daisy-like flowers with yellow centres and white ray-florets. Stinking Mayweed is an annual species, whereas Common Chamomile is a perennial, and appears to favour moister soils than does the former species. Both plants are introductions from Europe.

These two chamomiles are becoming much too plentiful in some localities, and where good cultivation is possible this should be employed for their suppression. In places unsuitable for the plough, the plants should be hoed out, or sprayed with an arsenical preparation when they are coming into flower. It must not be forgotten that the use of any poisonous chemical in their suppression would necessitate the removal of all stock for a time from areas so treated.

There are many people under the impression that the application of arsenical herbicides causes lasting injury to the soil, but such is certainly not the case if they are properly applied.

In the first place, the best of these preparations contain arsenic in a highly soluble form, so that its action on plant tissue is both rapid and destructive; therefore only sufficient should be applied to stop the

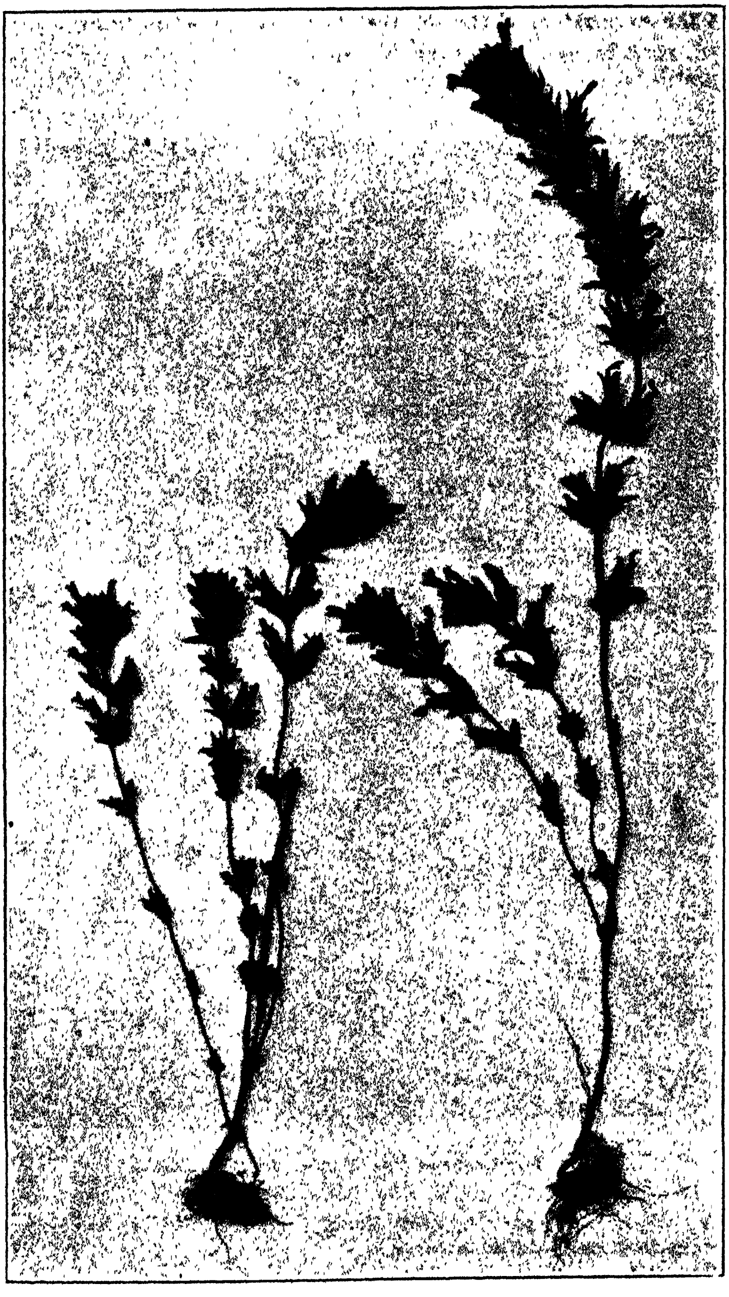

Fig. 66.—*Bartsia latifolia*, Sibth.

functioning of the plant. This should be the aim of the operator, and not the sterilization of the soil that so many appear to think necessary.

It must be remembered that the spraying of a poison over the foliage of weeds in the form of a misty spray makes for an even distribution over both soil and plants, which apart from its effectiveness is also the most economical form of application.

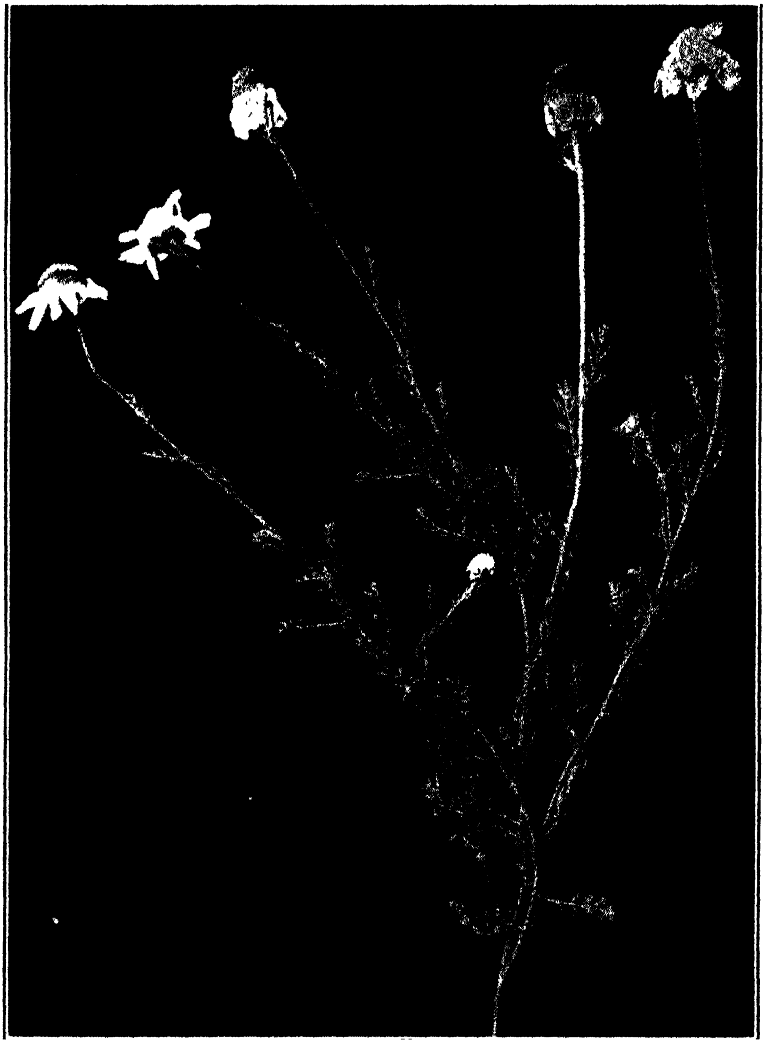

Fig. 67.—Common Chamomile, *Anthemis nobilis*, L.

There is yet much to be learnt as to the best and most effective use of chemicals for weed destruction on soils of widely different character.

The use of arsenical or salt applications to arable lands is not recommended by the writer, but on soils of a non-agricultural character one or the other can usually be employed with good results. An application of salt on some classes of soil, however, would have a much more injurious effect on the land than would one or two applications of an arsenical preparation.

(*To be continued.*)

EFFECT OF SELECTION OF SEED ON THE YIELD OF THE POTATO CROP.

In view of the stress placed by the Victorian Department of Agriculture on the importance of selection of seed potatoes from heavy-bearing plants and the inadvisability of changing seed without some certainty that better-constitutioned seed is being obtained, the following article dealing with these points, from the *Journal of the Department of Agriculture and Technical Instruction for Ireland*, is of interest:—

In previous experiments tubers were selected from plants which produced much above the average yield of their variety in weight of "ware" and seed-sized tubers, with a comparatively small proportion of "chats" or refuse, and the results obtained were compared with an equal number of tubers of corresponding size taken from other plants of the various varieties, without paying any regard whatever to the productivity of the parent plants.

In the autumn of 1921, when the plots were being dug at Dundonald, the produce from the best stalks was again selected and boxed, and, at the same time, an equal number of similar-sized tubers, picked in the usual way, without any regard to their parent plants, was boxed for use for purpose of comparison.

The whole stock of seed of the various varieties, selected and non-selected, was brought in the spring of 1922 to the Albert Agricultural Farm, Glasnevin, Dublin, and grown there.

The selected and the non-selected "seed" of each variety was planted in drills, side by side. The varieties comprised:—"Edzell Blue," "Great Scot," "Ally," "British Queen," "Arran Comrade," "Majestic," and "Bishop." The plots were all well manured, and twice sprayed.

During the growing season there was a remarkable difference in foliage between the selected and non-selected "seed" in the case of "Edzell Blue," "Great Scot," "Ally," "Majestic," and "Bishop," while, in the case of "British Queen" and "Arran Comrade," there was no noticeable difference.

The foliage of the plants produced by the selected seed was far more vigorous and grew much taller in the five varieties mentioned than the foliage of the plants from the non-selected seed. The lack of vigour in the plants produced from the non-selected seed appeared to be very largely attributable to the disease known as "Leaf Roll." The number of plants affected with this disease in each plot was carefully counted, and the result is shown in the following table:—

Table I. showing percentage of Plants affected with "Leaf Roll."

Variety	Selected Seed—Percentage of Plants apparently affected with "Leaf Roll."	Non-Selected Seed—Percentage of Plants apparently affected with "Leaf Roll"
Edzell Blue	77	36
Great Scot ..	24	80
Ally	24	100
British Queen ..	40	33
Arran Comrade ..	34	48
Majestic	6	66
Bishop	40	42

The yields obtained from both sets of tubers are shown in Table II., from which it will be observed that, as regard saleable potatoes, the selected seed, on the average of the seven varieties, gave a yield of 3 tons 6 cwts. per statute acre more than the non-selected seed; that in the cases of "Arran Comrade" and "British Queen" the selected seed did not yield quite as well as the non-selected, and that, as in 1921, the greatest differences were shown by "Majestic" and "Ally."

It will also be seen that, except in the case of "Edzell Blue," the yield of tubers corresponded approximately with the appearance of the foliage. The foliage produced by the selected seed of "Edzell Blue" was much more vigorous and remained green longer than the foliage from the non-selected seed, in spite of the fact that a much larger proportion of the plants was apparently affected with "Leaf Roll." The crops were weighed on the 2nd October, when all the stalks which appeared to be healthy were dead ripe, but some of the plants—notably of "Edzell Blue"—affected with "Leaf Roll" were still green. As was anticipated from the appearance of the foliage, there were remarkable differences in the yields from the selected and the non-selected seed of "Majestic," "Ally," "Bishop," and "Great Scot," but although the same result was expected in the case of "Edzell Blue," there was practically no difference in the yields. It is rather difficult to explain the difference in yields of the two plots of "Arran Comrade," but it may be pointed out that the greater yield from the non-selected seed was largely made up of small and unsaleable tubers.

In the experiments conducted in 1920 and 1921 no records were made as to the presence or absence of "Leaf Roll" in the plants produced by the selected and non-selected seed, but, in view of the results recently obtained from the scientific investigation of "Leaf Roll," it would now appear probable that the seed used in these experiments in all three years, and more particularly the non-selected seed, was infected, at least to some extent, with this disease. In fact, these experiments would go to show that the increased yield due to selection may be largely, if not entirely, attributable to the greater freedom from disease—particularly "Leaf Roll"—of the plants from selected seed. Tests conducted elsewhere would also bear out this conclusion. Thus, in Co. Louth, "Lochar," practically free from "Leaf Roll," gave a yield of 22 tons 16 cwts. per statute acre, whereas "Lochar," with over 80 per cent. of the plants affected with "Leaf Roll," gave a yield of 13 tons 12 cwts. per statute acre, and five plants of the variety "Crusader," free from "Leaf Roll," gave a yield of 21 lbs., while five plants of the same variety, badly affected with "Leaf Roll," gave a yield of only 2 lbs.

Attention may be directed to three points which, though incidental, are demonstrated by the experiment and are of great practical importance.

(1) *A change of seed is of little or no value, unless the seed is the produce of a healthy, vigorous crop.* It should be observed that all the seed planted in connexion with the 1922 experiment was brought from the North of Ireland, and that such a "change" is generally regarded as a beneficial one. The yield produced by the non-selected "Majestic" and "Ally" seed shows, however, that despite the change. this seed produced a very poor crop.

Both lots of "Lochar" potatoes used in the Co. Louth tests, to which reference has already been made, were brought from the North of Ireland, and here again a poor crop resulted in one case.

(2) Where well known prolific varieties, properly cultivated, do not produce satisfactory crops, the failure may be due to the effects of "Leaf Roll" or some similar disease.

In such a case the most advisable course is to dispose of the whole crop, and to procure a supply of fresh seed from a healthy vigorous crop.

(3) It is impossible to grow a good crop unless a good strain of seed is planted. Thus the detailed particulars given in Table II. show that a bad (diseased) strain of "Majestic" produced 6 tons 12 cwts., and that a healthy vigorous strain yielded 18 tons 11 cwts. per statute acre under exactly similar conditions. Sufficient attention has not hitherto been paid to the importance of a healthy vigorous stock of seed.

The selection of seed from good plants of the "Champion" variety has also been continued, and very encouraging results have been obtained. As is well known, this variety has deteriorated to such an extent that a crop exceeding 8 or 10 tons per statute acre is rarely found. By planting the produce of good productive plants a crop of 14 tons 4 cwts. per statute acre was grown in 1922 in Co. Louth. It is proposed to continue the selection of this variety, as it seems possible by working in this direction to recover the former productivity of the "Champion."

TABLE II.

Variety.	Yield per statute acre from Selected Seed.				Yield per statute acre from Non-Selected Seed.			
	Saleable.		Total.		Saleable.		Total.	
	tons	cwt.	tons	cwt.	tons	cwt.	tons	cwt.
Edzell Blue . ..	8	2	12	6	8	0	12	18
Great Scot .	10	15	12	1	8	10	10	2
Ally	13	4	15	9	5	2	6	10
British Queen .. .	12	6	14	6	12	8	14	12
Arran Comrade ..	8	10	10	17	9	1	13	1
Majestic . .	16	0	18	11	4	18	6	12
Bishop	10	16	12	6	8	13	10	2
Average . ..	11	8	13	12	8	2	10	11
Average, 8 varieties, 1921	15	5	16	13	12	12	13	12

POULTRY NOTES, RESEARCH FARM, WERRIBEE.

By W. Pederick, Poultry Foreman.

July is the beginning of the Poultryman's busiest season, for it is in this month that hatching operations start.

Poultry breeders in the past have been afraid to hatch chickens too early, as the pullets are likely to go into a false moult. Our experience is that early-hatched pullets will lay more than enough eggs to pay for their keep during the moulting period, and there is a good profit to be obtained from the cockerels if sold at the right age, which is 13 to 15 weeks old.

The stud hens are now through their moult, and just coming in to lay, which is the proper time to mate them.

All hens to be bred from are either tested or have been bred from tested stock. All male birds in the breeding pens are those that have been bred from single-tested hens.

The incubators are in readiness. Thermometers have been tested, and about 800 eggs are in the machines.

Although some very cold and wet weather has been experienced during the month of June, the egg yield has steadily increased, the last two weeks showing an increase of over 200 eggs a week. Pullets in the single pens are laying well. Black Orpingtons have laid up to 30 eggs a month and White Leghorns up to 27 eggs a month.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

SPRAYING.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

The Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil.

Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Paeonies, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), 'Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

The Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

LIVE STOCK.

HORSES.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible, be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Journal of Agriculture*, Nov., 1922 and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Decide on the breed and number of rams required for the coming season. Place orders as soon as possible. Breeders can then give better satisfaction, and allot preference to the earlier applications. The result of mating should be given most careful consideration from both wool and mutton points of view. Evidence points to an extreme shortage of good merino and fine crossbred wool for years to come. At the same time, a steadily increasing demand has set in for materials manufactured from these finer grades. The world's civilian requirements must be met, and for flannels and finer materials for temperate and cold climates these are indispensable. After all coarse wools have a limited use. Cull stud ewes carefully, especially merinoes, consider form as well as evenness of covering and style of wool. Discard for thin fribby forearms, for coarse common thighs, for mushy wasty undercovering, inferior patches across the shoulders, common and short between the hip bones. Individual merit must be considered first, pedigree alone is not sufficient.

CULTIVATION.

Farm.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

Vineyard.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply first acid iron sulphate treatment. Owing to the dry spring, black spot was not in evidence last season. The fungus is not dead, but dormant, hence preventive treatment must not be neglected. Leaflets dealing with black spot and its treatment will be supplied on application.

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

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WATER REQUIREMENTS OF FARM CROPS.

(Continued from page 404.)

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

THE RAISING OF DROUGHT-RESISTANT VARIETIES OF WHEAT.

The production of new varieties of wheat to meet the requirements of a low transpiration rate opens up a field of vast possibilities. Just what causes drought resistance in field plants is not definitely known. Certain crops—particularly the sorghums—have a low Transpiration Ratio compared with other summer-grown crops, and are known to be very resistant to drought. In this case the ability to withstand drought is due to the fact that during hot, dry weather, the leaves roll up and decrease the area of transpiring surface. Other drought-resistant plants have thickened cuticles, relatively few stomata, or are covered with a waxy coating, or a covering of hairs, which tend to lessen evaporation.

Fitting (1911) has suggested that drought-resistant crops approach the condition of desert plants, which possess a high osmotic pressure, and are therefore able to extract moisture from relatively dry soils in which the water films are very thin.

It was formerly thought that transpiration was controlled by the stomata and that transpiration varied with stomatal aperture.

Darwin (1898, 1904) based his horn hygroscope and differential temperature methods of estimating stomatal aperture on this assumption.

Lloyd (1908) investigated the relation between stomatal aperture and transpiration, and showed that the graph of transpiration did not follow changes in stomatal aperture, and concluded that except when the stomata were almost closed stomatal aperture did not control transpiration.

10018.

Knight (1917) carried out experiments to determine the relationship between stomatal opening and transpiration and showed that there was no agreement between the two, because a decreasing transpiration rate is often accompanied by stomatal opening, and *vice versâ*. He showed that a high water content of the leaf influenced the rate of transpiration, and that though the stomata are very sensitive to light, they may continue to open even though the water content of the leaf is decreasing.

Livingston (1906, 1913) showed that the rate of transpiration rose during the early morning hours, but the rise was checked before the evaporating power of the atmosphere, as measured by the rate of loss from atmometers reached a maximum, i.e., some factor other than external atmospheric changes tends to reduce the rate of transpiration.

Shreve (1914) demonstrated the existence of this inhibiting factor in various plants.

Livingston concluded that the regulating mechanism was not stomatal in nature, because of its early appearance before any stomatal aperture was to be expected.

Trelease and Livingston (1916) showed that maximum stomatal aperture was reached three hours later than the maximum transpiring rate.

Livingston and Brown (1912) demonstrated that the water content of transpiring leaves was not constant throughout the day, but that it tended to decrease during the morning and reached a minimum at about the same time as the evaporating power of the atmosphere reached a maximum. The explanation offered was that as the evaporating power of the air increases, a corresponding increase in the transpiration results, which reduces the water content of the leaf, which in turn lowers the transpiration rate by the incipient drying of the walls of the cells. Hence the view that the rate of transpiration is controlled by changes in stomatal aperture appears to be untenable.

Transpiration is essentially the evaporation of moisture from a wet leaf surface and fluctuations in atmospheric conditions—temperature, relative humidity, wind velocity—which increase or decrease evaporation from a free water surface produce precisely similar effects on plants. Varieties of wheat which, by their habit of growth, mature when the atmospheric conditions are favorable for intense evaporation, transpire water more freely and have a higher Transpiration Ratio than varieties the ripening period of which is coincident with less intense environmental conditions.

We have seen that while wheat varieties do not differ widely in respect to the transpiration ratio for dry matter, they do show very material differences in the transpiration ratio for grain, mainly because of specific differences in the migration ratio.

This quality of high migration ratio was shown to be associated with a well-developed root system, with short straw and relatively scanty foliage.

Earliness of maturity may be of great importance for the production of varieties suited to arid localities.

October is the critical period for the wheat crop in Australia. The month of October is invariably associated with high temperatures, low humidity, and hot northerly winds. Varieties of wheat which are well on towards maturity before these hot northerly winds set in are likely to have a low water requirement, and to suffer less from shortages of soil moisture than the late maturing varieties, the ripening period of which is coincident with intense evaporation.

The varieties grown in the more arid portions of the wheat belt are mainly early-maturing types, *e.g.*, King's Early, Gluyas, Steinwedel, Mac's White, Bunyip, and Canberra. High migration ratio and earliness of maturity are, therefore, two important qualities for wheats grown in arid districts.

Seelhorst (1910) after fourteen years' work, extending from 1896 to 1910, concluded that soil moisture content can influence ripening characters to such an extent that varietal characters are lost.

Harris (1914) showed that wheat matured fourteen days earlier with a moderate content of soil moisture than with soil containing a high percentage of water. He also showed that the effect of fertilizers was dependent on the amount of soil moisture present. Other workers who have conducted experiments on the relation of transpiration to soil moisture content are Il'Enkov (1865), Sorauer (1880), Maercker (1896), Burgerstein (1901, 1904), Deherain (1902), Fortier (1902), Seelhorst and Bunger (1907), Ohlmer (1908), Preul (1908), Pfeiffer (1912), and Thom (1913).

With irrigated crops the moisture content of the soil may be controlled for the benefit of the crop. The soil moisture content may be kept within the limits which enable rapid growth to be made at relatively low water cost. With moderate degrees of soil humidity the maximum production is obtained at the lowest water cost. With the wheat-grower the position is very different. Practically the entire wheat crop of Australia is dry-farmed.

A considerable amount of moisture may be conserved by fallowing, and especially by summer fallowing, and losses by evaporation from the soil may, to some extent, be controlled by harrowing or intertilling the growing crop.

On the whole, however, the wheat-grower is at the mercy of the elements; and the moisture content of the soil, especially in spring and early summer months, is in most years below the optimum for vigorous growth..

The production of varieties of wheat suited to the peculiar environmental conditions of the wheat belt is more important to our future wheat production than the possible control of the soil conditions to suit the needs of the varieties now grown in the wheat areas.

Varieties which mature early are likely to have a lower water requirement than late maturing types, because their ripening period is coincident with less severe environmental conditions.

Varieties with a high migration ratio have a much lower water requirement for grain, and can therefore use the scanty moisture supplies for grain production more economically than those with low migration ratios.

Hence early-maturing types with a high migration ratio are likely to be the best yielding and most prolific varieties for the semi-arid conditions characteristic of a large portion of the wheat belt of Australia.

There are two broad lines on which we may work for the production of a variety suited to arid districts—(1) Acclimatisation, (2) Hybridisation. The introduction of wheats produced under foreign climates is likely to prove of value in two ways—(*a*) as a direct source of new and useful varieties, (*b*) as an indirect means by cross-breeding of improving prolific local types with the specific excellence of the introduced type.

The introduction of varieties grown for centuries in the driest parts of the world offers a means of securing types which may be of extreme value for Australian conditions. Some of these varieties would doubtless be of direct use. They would be cultivated as soon as their yielding capacity had been demonstrated.

The most promising method for the production of early prolific varieties is hybridisation. Great impetus has been given to genetic research during the past twenty years by the re-discovery of Mendel's Law, and many interesting applications of the law have been worked out for the inheritance of unit characters of wheat.

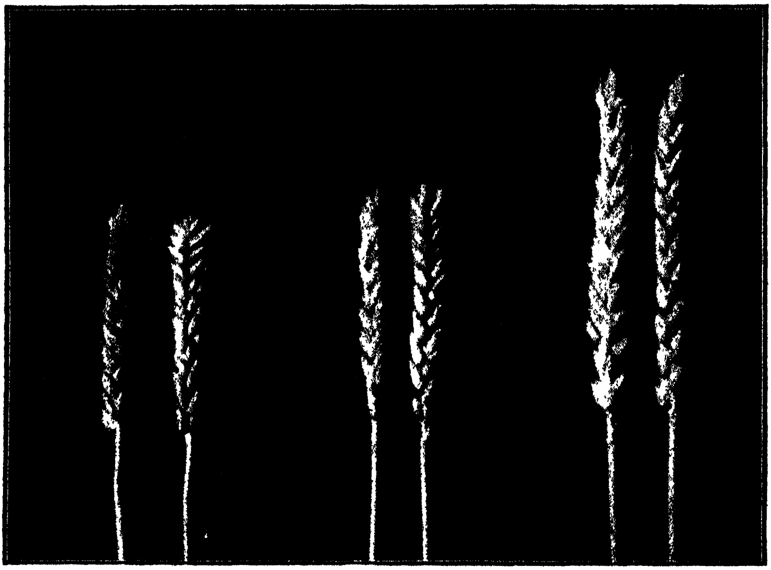

Fig. 33.—Cross-bred wheat "Gallipoli," with pollen parent on left and ovule parent on right.

Mendel's conception of the plant being made up of a number of unit characters, each of which is independently inherited, in accordance with a definite scheme, is of the utmost value to the plant breeder, and has enabled wheat breeding to be established on a sound basis. The desirable unit characters of two or more wheat varieties can now be combined by hybridisation into one plant, with the certainty that there will be, in the segregating generation of the cross-bred, at least one homozygous, or pure breeding form, containing the desirable characters.

At the State Research Farm, Werribee, exhaustive investigations have been made to determine the mode of inheritance of certain unit characters in wheat and barley. Some of these investigations have involved the classification and segregation of over 20,000 plants.

The following pairs of characters have been found respectively dominant and recessive with wheat:—

DOMINANT.	RECESSIVE.
1. Red or Bronze coloured chaff	White chaff
2. Bald ears	Bearded ears
3. Lax ear	Dense ear
4. Woolly chaff	Glabrous chaff
5. Hollow straw	Solid straw
6. Dark endosperm (in Spelt types and Cedar)	Starchy endosperm
7. Early maturity	Late maturity

The most important quality a wheat can possess is prolificness. What factors constitute prolificness are not definitely known.

So far as genetic characters are concerned prolificness appears to be dependent on the length of ear, number of spikelets in the ear, number of grains per spikelet, and the average weight of the grain. It is also possibly dependent on tillering capacity.

Investigations were made at Werribee to determine whether high-yielding power and low-yielding power, as a whole, are heritable characters. The method adopted was to make crosses between the most prolific wheats, *e.g.*, Federation, Yandilla King; and low-yielding wheats, *e.g.*, Huguenot and Bobs. On field plots Huguenot for many years stood out as the lowest-yielding wheat grown at Werribee. Its cultivation, owing to these low yields, has since been discontinued. In the second generation the individual plants were grown in centgener squares, and the prolificness of each plant was measured by the yielding capacity of a hundred of its progeny.

While the pure lines of Federation, Yandilla King, Bobs, and Huguenot each showed normal frequency curves when the weights of individual plants were plotted, the second generation cross-breds showed distinct segregation into low-yielding and high-yielding variants.

Plants taken from the high-yielding group were sown in centgener squares alongside plots from the low-yielding group. The following were the results:—

WEIGHT OF GRAIN IN CENTGENER PLOTS FROM HIGH-YIELDING AND LOW-YIELDING VARIANTS SELECTED FROM F_2 CROSS-BRED WHEATS.

Variety.	Huguenot x Federation.	Huguenot x Yandilla King.	Bobs x Federation.	Average of three crosses.
	grams.	grams.	grams.	grams.
1. High-yielding variants ..	160	138	240	179
2. Low-yielding variants ..	106	127	197	143

In each case the plants taken from the high-yielding variants gave considerably greater yields in the F_3 generation than the plants taken from low-yielding variants, showing that the differences in yielding capacity were transmitted to the progeny. The centgener method of testing tends to eliminate fluctuations in yield due to external environment. A description of the method used in planting these centgener plots was described by Richardson and Green.*

Before leaving the subject of prolificness, one further point should be borne in mind. If we cross two plants which differ in prolificacy, the plants of the second generation often produce segregated families of plants, with a range of variation at least equal to that of the parents, and occasionally extreme forms occur, which exceed the limits of prolificacy of either parent.

These forms may be isolated and made the starting point of new types. We may take as an illustration a new cross-bred barley produced at the State Research Farm, Werribee, by crossing a prolific six-rowed barley (Skinless) with a two-rowed bearded malting type (Pryor). From this cross a six-rowed bearded barley was obtained which gave a race of plants with a higher yield and higher migration ratio than either of the parent forms.

TABLE XXXVII.

AVERAGE WEIGHT OF GRAIN AND MIGRATION RATIO IN CROSS-BRED BARLEY PRODUCED BY CROSSING SIX-ROWED BEARDLESS (SKINLESS) AND TWO-ROWED BALD (PRYOR).

Variety.	Average weight of 100 plants.	Average weight of grain from 100 plants	Percentage of grain to total crop
	grams.	grams	%
Two rowed Bearded (Pryor) ..	1,572	368	23
Six-rowed Bald (Skinless)	1,824	640	35
Crossbred b 6 (Skinless x Pryor) ..	1,952	824	42

The results obtained in these tests† were confirmed by field tests, which showed that the average yield of the fixed cross-bred was 28 per cent. higher than the six-rowed parent.

While the yielding capacity of wheat and barley varieties is the resultant of genetic characters as well as environmental conditions, there is evidence to show that prolificness is a heritable character, and that F_2 cross-breds between prolific and non-prolific varieties segregate into low and high yielding variants, and that among these latter homozygous types are often obtained which exceed in yield the average prolificness of either parent.

Much more work requires to be done to determine the factors which make up the complex of prolificness, but the experience of wheat-breeders in Australia shows definitely that cross-breeding wheats of selected parentage is the most potent means of producing new types of value for the wheat belt.

In the production of Federation wheat, the result of composite crossing of Purple Straw (a prolific local variety) with Yandilla (a Fife-Indian variety), William Farrer succeeded in obtaining the most prolific and popular variety used in the wheat belt. Mr. H. Pye, Cerealist at Dookie College, has produced several cross-bred varieties, *e.g.*, Currawa and Major, which are widely grown in the more favoured portions of the wheat belt.

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* *Journal of Agriculture of Victoria*, March, 1916, pp. 140–146.

† A. E. V. Richardson—Production of Cereals for Arid Districts—Bulletin No. 7, Institute of Science and Industry, Melbourne.

The writer produced a number of cross-bred wheats while in charge of cereal-breeding investigations in the Department of Agriculture, South Australia. Among these a cross-bred —Clubhead x Yandilla King—since named Gallipoli, has done remarkably well in tests made at various centres in the wheat belt. Clubhead is an early maturing brown-chaffed variety, with short straw and bold, compact, awnless ears. It is, however, quite unsuited for cultivation, as it shakes badly at harvest time. Yandilla King, on the other hand, is a late maturing,

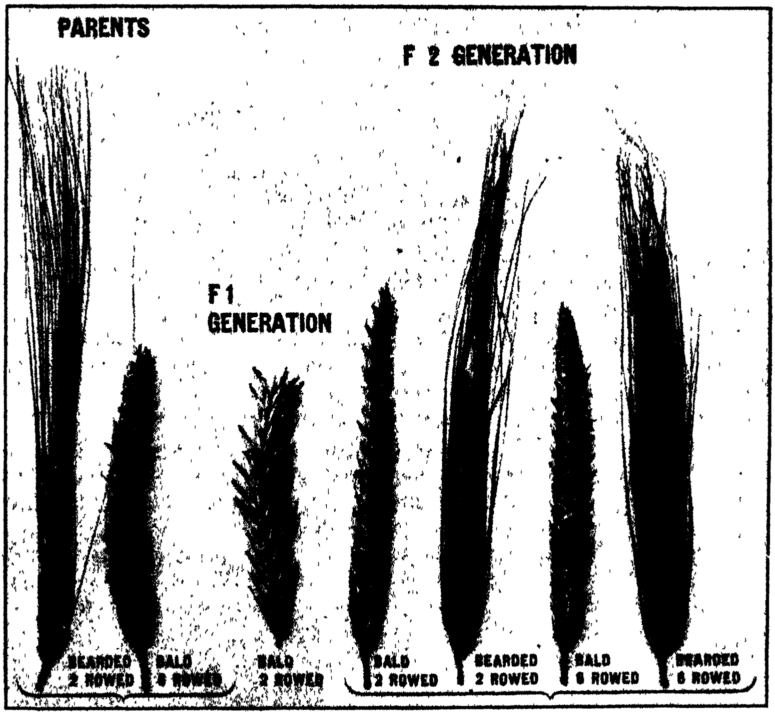


Fig. 34.—Cross-bred barleys produced by hybridising Pryor (two-rowed, bearded) and Skinless (six-rowed, bald).

F_1, First generation, hybrid. F_2, Second generation, genotypes.

white-chaffed variety, with somewhat lax and slightly tip-awned ears. It holds its grain very firmly. The cross-bred Gallipoli is a short-strawed wheat with strong upright straw, and difficult to thresh. The ears are brown in colour, with dense, compact, bald ears. Compared with Federation, it is much shorter in the straw, darker brown in colour, more compact, and matures about the same time. It is also more resistant to rust and flag smut, and has yielded better in nearly every field test in which it has been tried.

For six years (1915-1920) during which it was being tested at the State Farm, Werribee, the average yields of Gallipoli, Federation, and Yandilla King were as follows:—

Gallipoli	22 bushels	38 lbs.
Federation	19 ,,	43 ,,
Yandilla King	19 ,,	20 ,,

During the seasons 1920-22 it was tested at the following centres:—Longerenong, Salisbury, Warracknabeal, Cowangie, Carwarp, and Rutherglen, with Federation and other varieties. The results for three years were as follows:—

Centre	Federation.	Gallipoli.
Longerenong Agricultural College	46·1	50·9
Salisbury	43·2	46·4
Warracknabeal	27·2	29·7
Cowangie	21·7	22·4
Carwarp	13·3	14·4
Rutherglen	13·9	16·3
Werribee	27·9	30·7

By cross-breeding wheats of selected parentage new varieties may be produced which combine earliness of maturity, high migration ratio, and high-yielding capacity. Practically the whole of the varieties of wheat grown to-day in the Australian wheat belt are the products of local wheat-breeders' efforts, and the majority of the prolific varieties are of cross-bred origin.

With cross-breeding it is possible to create new combinations of unit characters which never existed before. Each character is independently inherited in accordance with the Mendelian law, and it is possible to associate almost any combination of characters in one variety.

To make substantial progress we need to analyze thoroughly our material to determine the unit characters which make up the complexity of the cereal plant, and determine precisely the inheritance of each group of characters. Some of this work has been done, *e.g.*, the inheritance of what might be termed the botanical characters has been determined. But the more important and difficult part—the determination of the factors which compose the mosaic of prolificness, drought resistance, low water requirements—remains to be determined.

Once the material is analyzed and the mode of inheritance worked out, wheat breeding will be placed on a scientific basis, and future work will yield results of astonishing value to the Commonwealth. The work of cereal improvement is in its infancy in Australia, and the striking success already achieved by hybridisation is extremely encouraging. Milling quality, disease resistance, drought resistance, and high yielding capacity have been imparted to different varieties of wheat to a high degree.

The nature of the Australian climate, and the fact that the rainfall rapidly diminishes and the water requirement of wheat increases as we pass from the coast to the interior, makes a study of drought resistance and the production of varieties with low water requirement of fundamental importance. With the evolution of hardier strains with low water requirements, new territories may be subjugated, and the effective utilization of areas already under cultivation will be made more certain.

APPLICATION OF RESULTS TO IRRIGATED LUCERNE.

Under favorable soil and climatic conditions lucerne exceeds all other forage crops in weight and quality of product per acre. Approximately 100,000 acres of irrigated land in Victoria have been sown with this forage.

The relationship between the water supply and crop production, and the factors which affect the water requirements of lucerne are, therefore, of great practical importance.

The work of building storages and locks on the Murray River is well under way, and within the next decade the problems of irrigation in the Murray Valley will assume great national importance. Hitherto there has been little local data to guide the irrigationist in extracting the maximum return from each irrigable acre.

Some important problems for determination were—

1. The water requirement of lucerne and the variation water requirement at different periods of the year, and from season to season.

2. The effect of varying quantities of irrigation water on the yield of lucerne, and the determination of the optimum quantity of water for the production of lucerne at lowest water cost.

3. The effect of fertilizers on the growth of lucerne, and the water cost of dry matter produced.

Definite information regarding the first problem can be secured only by conducting transpiration tests over a period of years. Data regarding the last two problems can be best secured by a series of carefully controlled field tests.

The water requirement of lucerne was determined in triplicate for four seasons at the Rutherglen Pot-culture House. For the whole period the average Transpiration Ratio was 790.5. This is equivalent to 7.82 inches of rain for the production of 1 ton of dry matter. In other words, at Rutherglen the water requirement of lucerne was just double that recorded for wheat.

The Transpiration Ratio varies from season to season in accordance with the intensity of the physical environmental factors—air temperature, wet-bulb depression, wind velocity, evaporation. While the average Transpiration Ratio for lucerne for each season does not exhibit wide fluctuations, the water cost of the various cuttings does show considerable variation.

Thus lucerne produced in the spring or early summer shows a much lower water cost than lucerne which matures in February or March. This is clearly shown in each of the four years during which the test was conducted. The high water cost of lucerne produced in midsummer and early autumn is due to the much greater intensity of the water-dissipating factors at this season of the year. Throughout the four years the cuttings were made either when the lucerne began to bloom or when new shoots commenced from the base of the crowns. In three of the years during which the tests were made seven cuttings were obtained. During 1917-18, however, only two cuttings were made.

The results for the four seasons are summarized in Table XXXVIII.

TABLE XXXVIII.

WATER TRANSPIRED, WEIGHT OF DRY MATTER PRODUCED, AND TRANSPIRATION RATIO FOR LUCERNE, RUTHERGLEN EXPERIMENT FARM—SEASONS 1915–1919.

Number of Cutting.	Season 1915–16.			Season 1916–17			Season 1917–18			Season 1918–19			Average Transpiration Ratio for four years.
	Water Transpired.	Dry Matter.	Transpiration Ratio	Water Transpired	Dry Matter	Transpiration Ratio	Water Transpired.	Dry Matter	Transpiration Ratio	Water Transpired	Dry Matter	Transpiration Ratio	
	lbs.	grams		lbs.	grams		lbs.	grams		lbs.	grams		
First ..	4·38	6·57	302	20·33	12·03	767	20·71	14·06	669	32·04	26·27	554	573
Second ..	27·28	16·64	744	30·62	24·57	566	24·46	23·44	474	52·10	28·72	824	652
Third ..	21·97	16·90	590	21·61	23·87	411	19·99	13·90	653	21·77	16·21	610	566
Fourth ..	25·47	10·05	1,150	20·53	17·40	535	20·57	8·65	1,079	42·38	13·35	1,441	1,051
Fifth ..	26·03	9·75	1,212	17·98	11·82	690	34·65	13·36	1,177	26·16	9·06	1,310	1,099
Sixth ..	42·17	17·65	1,085	31·93	10·29	1,409	25·91	13·17	893	23·71	10·41	1,034	1,105
Seventh ..	13·55	11·52	534	16·07	8·09	902	..	..	..	36·17	14·17	1,159	865
Total Crop	160·85	89·08	819	159·07	107·93	675	146·29	86·58	767	234·33	118·19	901	790·5

The most striking feature of the table is the variation in the water requirement of lucerne at different periods of the year. During each year the cuttings made early in the season, *i.e.*, before the hot, dry weather was ushered in, were produced at a much lower water cost than the later cuttings. The three cuttings harvested during spring and early summer gave, over a four-year period, an average water requirement of 597, compared with a water requirement of 1,085 for the three cuttings harvested during summer and early autumn. In other words, the lucerne harvested during the summer months—when the water-dissipating influences were at a maximum—was produced at almost twice the water cost of the lucerne grown during the cooler part of the year.

Moreover, in most cases the earlier cuts gave greater yields of dry matter than the later cuts. For these reasons it would appear that where lucerne is grown on limited rainfalls, and under dry-farming conditions, it would be advisable to confine the cuttings to spring and early summer, when dry matter is produced abundantly at low water cost, and to graze the plants during the hot weather when the water requirement is high.

In other words, under dry-farming conditions lucerne should be allowed to grow freely at the season when the crop shows the lowest water requirement, and checked during periods when it produces dry matter at a maximum water cost.

The irrigation farmer has not, however, the same need to economize his water supply. The irrigationist can within certain limits supplement the rainfall by applying water to his crops at a time when they most need it, and he can, therefore, secure a full yield with a given expenditure of water, and can maintain lucerne fields in full vigour more or less permanently.

Under dry-farming conditions the available moisture supply may be insufficient to maintain continuous active transpiration, with the result that crop yields are lowered, and the plant may suffer actual injury by shortage of soil moisture.

We may say, therefore, that the water requirement of lucerne varies with the season, and more particularly with the time of the year at which it is cut, but for districts with climatic conditions similar to Rutherglen, the average water requirement is 790, and for districts similar to Werribee the water requirement is approximately 685 (Table 1). It is the most expensive of the farm crops tested so far as the water cost of dry matter is concerned.

To determine the effect of variations in water and fertilizer supply on the yield of lucerne and on the water cost of dry matter, a series of field investigations was begun at the State Research Farm, Werribee, in 1919. Ten acres of irrigable land were set apart for this purpose. The area had been used as an irrigation field for stud cereals from 1912 to 1918, but during 1919 it was carefully regraded to insure the most uniform and regular distribution of water.

A series of 40 border checks was laid out 5 chains long by ½ a chain wide, and two cement supply channels were used to convey the water from the main channel to the field. Shallow cement drainage ditches were used to collect any surplus water from the plots. At the entrance of the field each supply channel was provided with a special Dethridge meter (Fig. 36), to record the quantity of water used on each plot. Each levee bank was sown with a drill width of lucerne 6 ft. 5 in. wide.

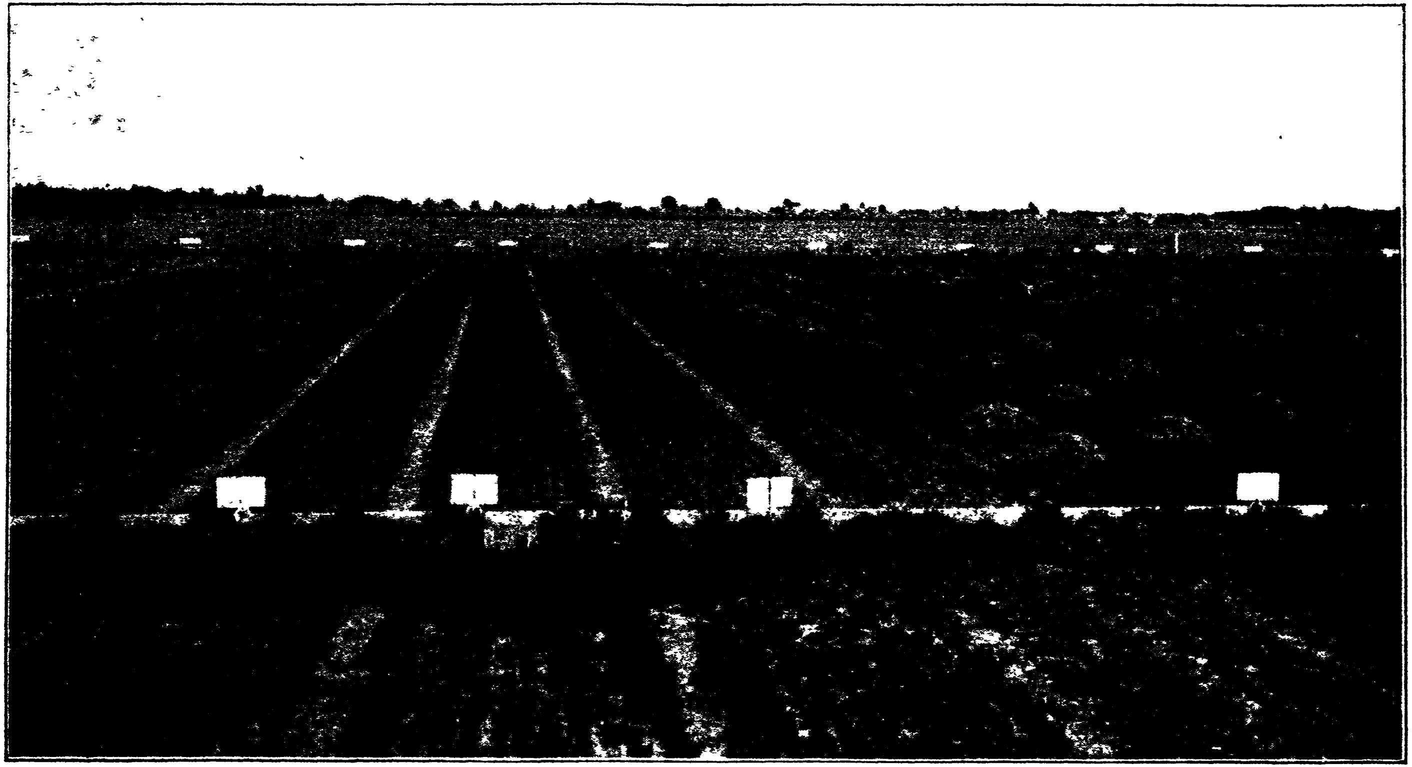


Fig. 35.—View of Rate of Watering Tests, Permanent Irrigation Field, State Research Farm, Werribee.

These strips were cut separately from the plots contained within each border, and were disregarded in determining the plot yields.

The remaining land between each levee bank was sown with three plots, each a drill width 6 ft. 5 in. wide, with a 22-in. space between each drill. The central strip was left unmanured. The other strips were sown with superphosphate (2 cwt. per acre) and rock phosphate (phosphate content equivalent to 2 cwt. super.) respectively. With the first series of plots—the rate of watering tests—quantities of water ranging from 18 to 48 inches were applied in six inch applications. One of the plots received no irrigation water.

All plots were cut separately and cured. Each cured lot at the time of weighing was sampled, and the moisture content determined. Thus the yield of dry matter for each plot was obtained, and also the yields of commercial hay calculated on an 85 per cent. dry basis.

Fig. 35 gives a general view of the rate of watering tests. The three central plots received no irrigation water throughout the three years during which the test was made. On the left are three plots receiving 24 inches of water per annum, and on the right the plots receiving 30 inches of water. In the foreground are a set of manurial trials.

The results of the rate of watering tests are summarized in Table XXXIX.

TABLE XXXIX.

EFFECT OF VARYING QUANTITIES OF IRRIGATION WATER ON THE YIELD OF LUCERNE HAY (CONTAINING 85 PER CENT. DRY MATTER).

State Research Farm, Werribee (1921-23).

Irrigation Water applied.	1921-22.	1922-23	Average for Two Seasons.
	cwt	cwt.	cwt.
1. Nil	35·8	23·6	29·7
2. 18″ water	116·3	105·8	111·0
3. 24″ ,,	137·25	131·4	134·4
4. 30″ ,,	150·3	147·0	148·6
5. 36″ ,,	162·4	143·8	153·1
6. 48″ ,,	171·1	159·9	165·5

The results of these tests show clearly the influence of water on yields of lucerne. Plot 1 received no irrigation water. The yields from this plot may be regarded as the measure of the growth from the rainfall received during the growing period of the crop. For the season 1921-22 the rainfall was 19.26 inches, and for 1922-23 only 12.69 inches of rain fell.

Yields of 35.8 cwt. and 23.6 cwt. per acre were obtained on these rainfalls, an average for the two seasons of 29.7 cwt. per acre. From these non-irrigated plots only two cuttings of lucerne were obtained each season. From all irrigated plots five cuttings were obtained.

An application of 18 inches of irrigation water resulted in a large increase in yield compared with the non-irrigated plot.

The average yield for the two seasons was 111.05 cwt. per acre—an increase over the control plot of 81.35 cwt.

Additional increments of water up to the limit used in the tests—48 inches per acre—gave increases in crop yield, but the rate of increase from successive moieties gradually fell off. Even the heaviest irrigation (48 inches) gave yields which showed a substantial margin of profit over and above the cost of the irrigation water applied.

The water cost of producing dry matter in lucerne with varying quantities of water was determined. The results for two seasons are summarized in the following Tables:—

TABLE XL.

EFFECT OF VARIATIONS IN WATER SUPPLY ON YIELD AND ON WATER COST OF LUCERNE—SEASON 1921-22.

State Research Farm, Werribee.

Treatment of Plot.	Water available for crop (rain and irrigation water)	Yield of Dry Matter per acre.	Quantity of water used to produce 1 ton of Dry Matter.	Amount of Dry Matter produced per acre foot of water used.
	inches	tons.	inches.	tons
1. No Irrigation ..	19·26	1·530	12.59	.960
2. 18″ irrigation water (3 6″ waterings) ..	37·26	4·930	7.55	1.584
3. 24″ water— (4 6″ waterings) ..	43·16	5·865	7.36	1·632
4. 30″ water— (5 6″ waterings) .	49·36	6·375	7·74	1·548
5. 36″ water— (6 6″ waterings) ..	55·26	6·885	8.02	1·488
6. 48″ water— (8 6″ waterings) ..	68·16	7·271	9·37	1·280

TABLE XLI.

EFFECT OF VARIATIONS IN WATER SUPPLY ON YIELD AND WATER COST OF LUCERNE—SEASON 1922-23.

Treatment of Plot.	Water available for crop (rain and irrigation water).	Yield of Dry Matter per acre.	Quantity of water used to produce 1 ton of Dry Matter.	Amount of Dry Matter produced per acre foot of water used.
	inches	tons	inches	tons.
1. No irrigation ..	12·69	1·030	12·15	·974
2. 18″ water— (3 6″ waterings) ..	30·69	4·496	6·82	1·758
3. 24″ water— (4 6″ waterings) ..	36·69	5·584	6·57	1·826
4. 30″ water— (5 6″ waterings) ..	42·69	6·247	6·83	1·756
5. 36″ water— (6 6″ waterings) ..	48·69	6·111	7·97	1·506
6. 48″ water— (8 6″ waterings) ..	60·69	6·796	8·93	1·344

TABLE XLII.

EFFECT OF VARIATIONS IN WATER SUPPLY ON YIELD AND WATER COST OF LUCERNE—AVERAGE OF TWO SEASONS.

State Research Farm, Werribee.

Treatment of Plot	Water available for crop (rain and irrigation water)	Yield of Dry Matter per acre.	Quantity of water used to produce 1 ton of Dry Matter.	Amount of Dry Matter produced per acre foot of water used.
	inches	tons	inches	tons.
1. No irrigation ..	15·97	1·28	12·37	·961
18" water— (3 6" waterings .	33·97	4·713	7·20	1·664
3. 24" water— (4 6" waterings) ..	39·97	5·724	6·98	1·718
4. 30" water— (5 6" waterings) ..	46·02	6·311	7·29	1·645
5. 36" water— (6 6" waterings) ..	51·97	6·498	7·99	1·500
6. 48" water— (7 6" waterings) ..	64·42	7·033	9·18	1·310

On the non-irrigated plot the actual water cost of dry matter was much higher than on any of the irrigated plots. The quantity of water required for each ton of dry matter produced was 12.59 and 12.15 acre inches respectively, an average for the two years of 12.37 acre inches.

With the heaviest irrigation, namely, 48 inches of water, the amount of water required for the production of a ton of lucerne was 9.43 inches and 8.93 inches respectively, an average for the two seasons of 9.18 acre inches

On the other hand, with moderate irrigation, *i.e.*, from 18 to 30 inches, the water cost of lucerne was much the lowest, the amount varying in 1921-22 from 7.36 to 7.74 inches per ton of dry matter, and, in 1922, from 6.57 to 6.83 inches per ton of dry matter respectively.

The most efficient use of water was obtained with the 24-in. irrigation during both seasons. During 1921-22 each ton of dry matter required 7.36 acre inches, whilst during 1922-23 only 6.57 acre inches were required.

In other words, on plots which received 24 inches of irrigation water, dry matter was produced at a water cost of 6.98 inches per ton, compared with a water cost of 9.15 inches with heavy irrigation, and 12.47 inches with no irrigation.

These water costs represent, of course, actual water costs under field conditions and include losses, by

(1) Evaporation from the soil,
(2) Seepage or percolation, and
(3) Transpiration.

Just how much of the total water is lost by percolation or evaporation from the soil under field conditions is difficult to determine unless the crops are grown in specially constructed drain gauges. The losses by seepage from subsoils, such as those at Werribee, when moderate quantities of irrigation water are used, are probably exceedingly small. Nor are the losses by evaporation from the soil very great in comparison with the amount used by transpiration, especially when the growth of the crop is normal or vigorous. Some losses certainly occur after each cutting of lucerne, when the land is bare, but within a few days of cutting the lucerne covers the ground, and for the greater part of the period of growth the whole of the soil is covered and shaded by a dense mass of vegetation.

Under these circumstances we may assume that with a good stand of luçerne, and with moderate irrigation, practically the whole of losses which occur are due to transpiration.

On the other hand, the growth on the non-irrigated plot is usually short and sparse, so that losses by evaporation from the soil are likely to be high.

With heavy irrigations some losses may occur through deep percolation, more especially where subsoils are porous. Losses from this source have, however; been negligible at Werribee even with heavy watering. Losses by evaporation from the soil are likely to be rather greater with heavy irrigations on account of the higher content of the surface layer of soil and the more frequent watering.

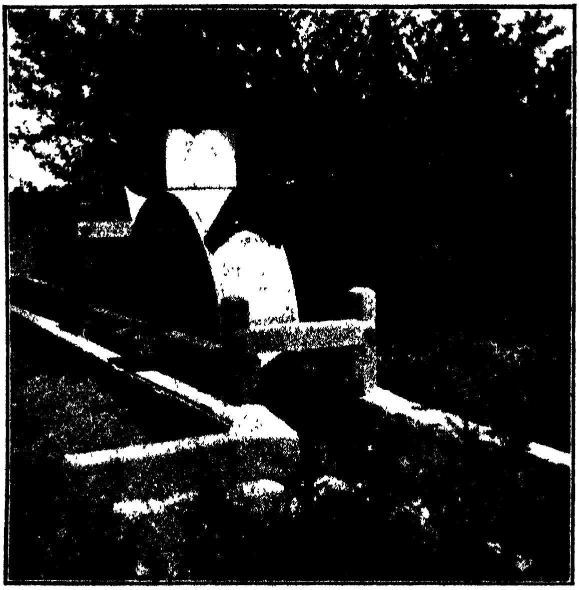


Fig. 36.--View of Dethridge Water Wheel, specially designed to measure small quantities of water.

A fertilizer test was included in the scheme of investigation work in order to determine the relative water costs of unmanured and fertilized lucerne.

With each variation in the amount of irrigation water used, plots treated with superphosphate were sown alongside unmanured contrals.

Comparisons were, therefore, obtained of the water cost of dry matter with manured and unmanured plots under varying conditions of water supply.

The results for the two seasons are summarized in Tables XLIII. and XLIV.

TABLE XLIII.

EFFECT OF SUPERPHOSPHATE ON THE YIELD AND ON THE WATER COST OF LUCERNE GROWN UNDER CONDITIONS OF VARYING WATER SUPPLY—SEASON 1921-22.

State Research Farm, Werribee.

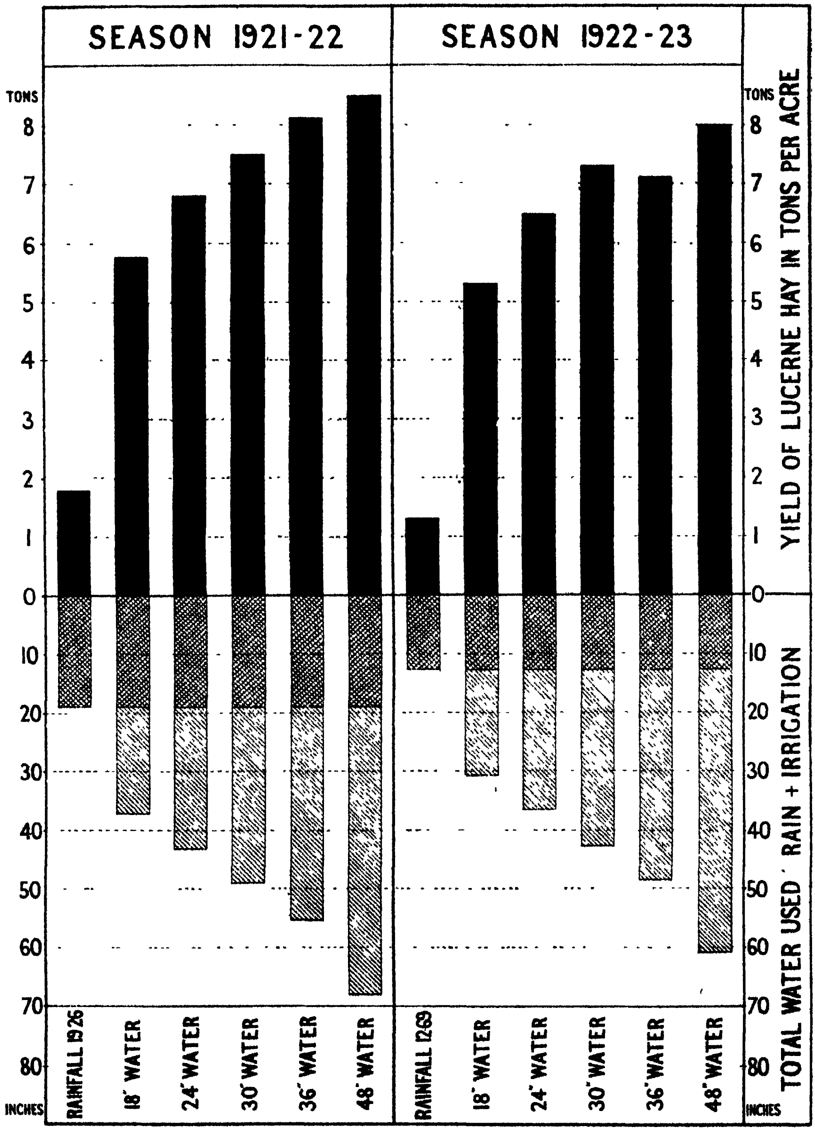
Treatment of Plot	Water available for crop (rain and irrigation water).	Yield of Dry Matter per acre.	Amount of Dry Matter produced per acre foot of water used.	Quantity of water used to produce 1 ton of Dry Matter.
1. No irrigation—	inches.	tons	tons.	inches.
A. Superphosphate ..	19·26	1·541	·237	12·50
B. No manure ..	19·26	1·402	·872	13·73
2. 18″ water—				
A. Superphosphate ..	37·26	4·875	1·569	7·64
B No manure ..	37·26	4·598	1·479	8·10
3. 24″ water—				
A. Superphosphate ..	43·16	6·009	1·670	7·18
B. No manure ..	43·16	5·563	1·545	7·76
4. 30″ water—				
A. Superphosphate ..	49·36	6·583	1·599	7·49
B. No manure ..	..	6·060	1·472	8·14
5. 36″ water—				
A. Superphosphate ..	55·26	7·038	1·527	7·85
B. No manure ..	55·26	6·927	1·503	7·98
6. 48″ water—				
A. Superphosphate ..	68·16	7·263	1·276	9.38
B. No manure ..	68·16	7·051	1·240	9.66

TABLE XLIV.

EFFECT OF SUPERPHOSPHATE ON THE YIELD AND ON THE WATER COST OF LUCERNE GROWN UNDER CONDITIONS OF VARYING WATER SUPPLY—SEASON 1922-23.

State Research Farm, Werribee.

Treatment of Plot.	Water available for crop (rain and irrigation water).	Yield of Dry Matter per acre.	Amount of Dry Matter produced per acre foot of water used.	Quantity of water used to produce 1 ton of Dry Matter
1. No irrigation—	inches.	tons	tons.	inches
Superphosphate ..	12·69	1·147	1·085	11·06
Nil	12·69	0·837	0·791	15·16
2. 18″ water—				
Superphosphate ..	30·69	4·636	1·812	6·62
Nil	30·69	4·088	1·598	7·51
3. 24″ water—				
Superphosphate ..	36·69	5·763	1·864	6·37
Nil	36·69	5·193	1·698	7·06
4. 30″ water—				
Superphosphate ..	42·69	6·358	1·787	6·71
Nil	42·69	6·264	1·760	6·81
5. 36″ water—				
Superphosphate ..	48·69	6·477	1·596	7·51
Nil	48·69	5·988	1·473	8·13
6. 48″ water—				
Superphosphate ..	60·69	7·433	1·468	8·16
Nil	60·69	6·213	1·227	9·76



GRAPH SHOWING RELATIONSHIP BETWEEN WATER SUPPLY AND YIELD OF LUCERNE

Fig. 37.—Relation of Water Supply to Lucerne Yields.

Black columns = Yield of Lucerne. Double-hatched columns = Rainfall.
Single-hatched columns = Irrigation water applied.

The results of these tests demonstrate the value of a water-soluble phosphate in stimulating crop yields and reducing the water cost of the dry matter produced. With each quantity of water used the yield of lucerne from the fertilized plots is higher than that of the unmanured controls, and conversely the water cost of dry matter is much reduced by the use of a soluble phosphate.

The effect of the superphosphate was very pronounced during the second season of the tests. The average of the water costs for the season 1922-23 was 9.07 acre inches per ton of dry matter for the unmanured plots, as against 7.74 acre inches per ton for the plots treated with a soluble phosphate. Thus the average water cost of all dry matter produced during the second year was 17.2 per cent. higher on the unmanured plots than on those treated with superphosphate.

It is apparent that the use of a moderate dressing of a water soluble phosphate materially increases the yield of lucerne and lowers the water cost of each ton produced.

The average water costs of lucerne (expressed in acre inches of water per ton of dry matter produced) for the fertilized plots and the unmanured controls are summarized in Table XLV.:—

TABLE XLV.

EFFECT OF SUPERPHOSPHATE ON THE WATER COST OF LUCERNE CROPS GROWN WITH VARYING QUANTITIES OF WATER.

Treatment of Plots	Acre inches of water required per ton of Dry Matter produced						
	Without Irrigation.	With 18″ water.	With 24″ water.	With 30″ water.	With 36″ water.	With 48″ water.	Average for all Plots.
No Manure ..	14·44	7·80	7·41	7·47	8.06	9·71	9·15
Superphosphate ..	11·78	7·13	6·77	7·10	7·68	8·77	8·20

Compared with the unmanured plot, superphosphate produced lucerne at a much lower water cost with all quantities of water tested, the effect of the superphosphate being more marked with no irrigation and with the heaviest irrigation. The average water costs for the unmanured lucerne was 11.6 per cent. higher than the water cost of lucerne treated with superphosphate. It was shown (page 274) that a liberal dressing of superphosphate in the presence of an abundant supply of nitrates brought about a marked reduction in the water requirements of wheat, particularly for grain. Victorian soils are deficient in phosphoric acid, and applications of water-soluble phosphate have proved to be essential for the profitable production of wheat throughout the State. Nor is there any less need to supply phosphate with lucerne, for a normal crop of irrigated lucerne removes from the soil far more phosphoric acid than does the average wheat crop.

To gain definite information in the nutritive elements removed by a lucerne crop, an analysis was made of all the cuttings—stems and leaves—obtained throughout the period of growth from the C series of tests (effect of variations in the water content of soil on the Transpiration Ratio), at the Rutherglen Pot-culture House.

The soils in this series of tests were maintained throughout the period of growth at 30 per cent., 45 per cent., 50 per cent., 75 per cent., 90 per cent. of saturation. The plants in the pots maintained at the highest degree of saturation died before the conclusion of the experiment, and the analyses of the plants from this series were excluded.

In a previous publication[*] the writer showed that a crop of lucerne producing 7 tons of dry matter (7 tons 17½ cwt. of hay) would remove from the following nutrients per acre in the hay—

Nitrogen	321 lbs.
Potash	348 lbs.
Phosphoric acid	65 lbs.
Lime	349 lbs.

Stored up in the roots of such a crop were the following nutrients per acre—

Nitrogen	69.2 lbs.
Potash	36.0 lbs.
Phosphoric acid	16.2 lbs.
Lime	39.6 lbs.

If we compare these quantities with the needs of a 30-bushel wheat crop we find that a lucerne crop yielding 7 tons of dry matter would remove from the soil sufficient phosphoric acid to supply the needs of five wheat crops, and would leave in the roots sufficient of the same ingredients to bring a 30-bushel wheat crop to maturity. The amount of nitrogen removed by the lucerne would supply the needs of nine wheat crops, and the amount left in the roots would suffice for two such crops.

Potash was removed in quantities sufficient for the needs of 36 wheat crops, and the roots contained enough to furnish potash for 30-bushel wheat crops.

The lucerne plant secures the greater part of its nitrogen from the atmosphere through the activity of the nitrogen fixing bacteria living symbiotically on its roots.

With respect to potash, most Victorian soils, especially clays and clay loams, are abundantly supplied with this ingredient, so that dressings of potash are usually unnecessary except when lucerne is grown on sandy or peaty soils, both of which are deficient in potash.

The position is very different with respect to phosphoric acid. The majority of Victorian soils are markedly deficient in this ingredient and the response of all crops, particularly wheat, to dressings of phosphate is very marked. One would not expect that heavy yields of lucerne could be maintained without liberal supplies of phosphate, in view of the fact that a seven-ton crop of lucerne would remove five times as much phosphoric acid as a 30-bushel wheat crop.

The results of three seasons' work on the permanent irrigation manurial tests at Werribee confirm this view.

The results of such tests are summarized in Table XLVI.

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[*] *Journal of Agriculture*, Victoria, August, 1916.

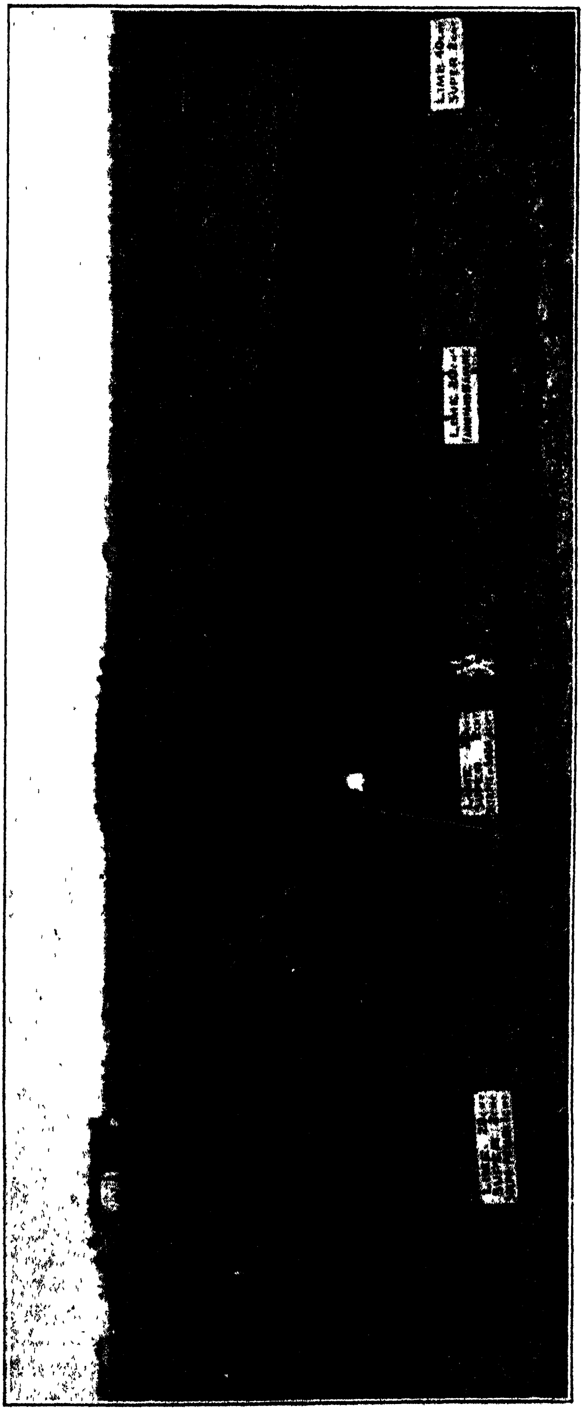


Fig. 38.—View of manurial trials with irrigated lucerne, State Research Farm, Werribee.

TABLE XLVI.

EFFECT OF VARYING QUANTITIES OF SUPERPHOSPHATE ON YIELD OF IRRIGATED LUCERNE—PERMANENT MANURIAL TESTS—(AVERAGE OF THREE SEASONS) 1920, 1921, 1922.

State Research Farm, Werribee

Plot Treatment.	Yield for 1922–3.	Average for Three Years.	Increase due to Fertilizer.
	cwt	cwt.	cwt.
1. No manure	103·1	125·1	..
2. Super. 1 cwt.	122·6	135·3	10·2
3. „ 2 cwt.	137·0	14. ·6	18·5
4. „ 3 cwt.	143·0	146·3	21·2
5. „ 4 cwt.	148·2	151·6	26·5
6. „ 2 cwt. and Gypsum 30 cwt. ..	149·8	158·2	33·1
7. Basic Slag (equivalent to 2 cwt. super.) ..	122·7	133·8	8·7
8. Bone fertilizer (equivalent to 2 cwt super.)	122·2	130·0	4·9

The results of this test show that all phosphates tested gave a substantial increase over the unmanured control, but that superphosphate was much superior to either basic slag or bone fertilizer.

The increase in yield over a period of three years obtained from 2 cwt. dressing of surperphosphate was more than double that obtained from an equivalent amount of phosphoric acid in the form of basic slag, and nearly four times that obtained from an equivalent of bone fertilizer.

Water soluble phosphate has given the same marked increase over basic slag and bone fertilizer with irrigated lucerne, as it has over the same fertilizers with the wheat crop.

The quantitative test with superphosphate is of interest. Successive moieties of superphosphate up to 4 cwt.—the highest quantity used in the tests—have given increases in hay yield. These increases show a substantial margin of profit after deducting the cost of the fertilizer applied.

It is evident that a dressing of 4 cwt. of superphosphate (18 per cent. P_2O_5), which adds to the soil 80.6 lbs. of phosphoric acid, does not represent the limit for the profitable use of superphosphate under the conditions obtaining at Werribee.

As these fertilizer plots received equal quantities of water, it follows that the water cost of the dry matter produced would be lowest on those plots receiving the heaviest dressings of water soluble phosphate.

The effect of 30 cwt. of gypsum in addition to 2 cwt. of superphosphate is significant. For the three years' period the average increase due to the application of 2 cwt. of superphosphate was 18.5 cwt., worth 55s. 6d. per acre, with lucerne at £3 per ton. Such increase was obtained at an extra cost of 14s., being the cost of the fertilizer and its application.

The addition of 30 cwt. of gypsum, costing an extra 37s. 6d. per acre, gave an increase of 33.1 cwt., worth 99s. 4d. per acre—obtained at a cost of 51s. 6d. for fertilizers.

The cost of the gypsum was paid by the crop and a substantial margin of profit resulted; but the action of the gypsum is likely to last for some years. The gypsum may be of value because of its effect in liberating potash, but it is more likely that its beneficial results are due in the main to an improvement in the texture and porosity of the subsoil.

Applications of soluble potash salts have not resulted in any increase in lucerne yields at Werribee. On the other hand, a dressing of gypsum, supplemented by 2. cwt. of superphosphate, has given an average increased yield for three years of 33.1 cwt. of hay over the unmanured plot, and 14.6 cwt. over the plot treated with superphosphate.

The action of the gypsum is most probably due to its flocculating effect on the fine clay particles in the subsoil, which would result in improved texture, better drainage and increased aeration, all of which would make the conditions more favorable for crop growth and more rapid movement of water in the subsoil.

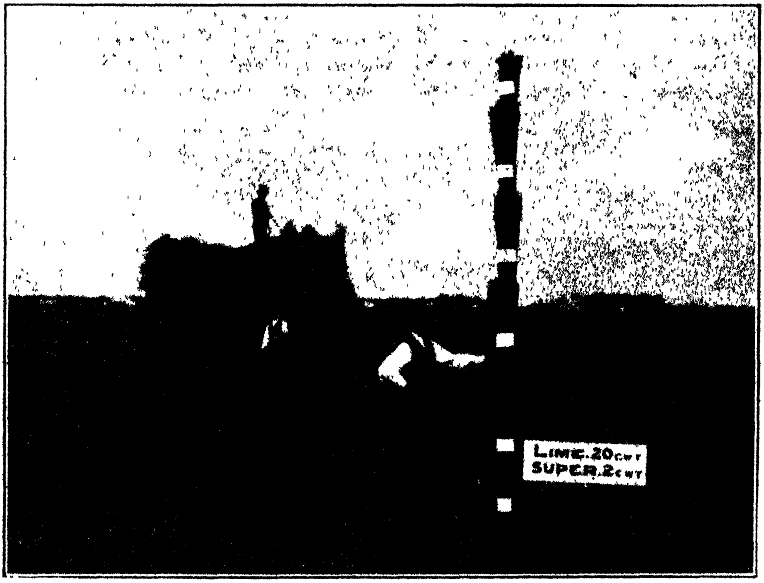


Fig. 39.--Lucerne pole, showing total growth in one season from plots treated with lime and superphosphate.

At the Leeton Irrigation Settlement, New South Wales, gypsum has been used as a top-dressing on lucerne with beneficial results, especially where lucerne has been planted on soils with stiff clay subsoils, or with a layer of hard pan in the subsoil.

The results obtained with gypsum at Werribee are of great importance to the irrigated areas. In the Goulburn Valley the soils are for the most part underlain by stiff clay subsoils which are more or less resistant to the free penetration of water and lucerne roots. If the texture of these clay subsoils could be materially improved by the use of gypsum, and the porosity thereby increased, the yield of lucerne would be increased and the water cost of the crop materially lowered.

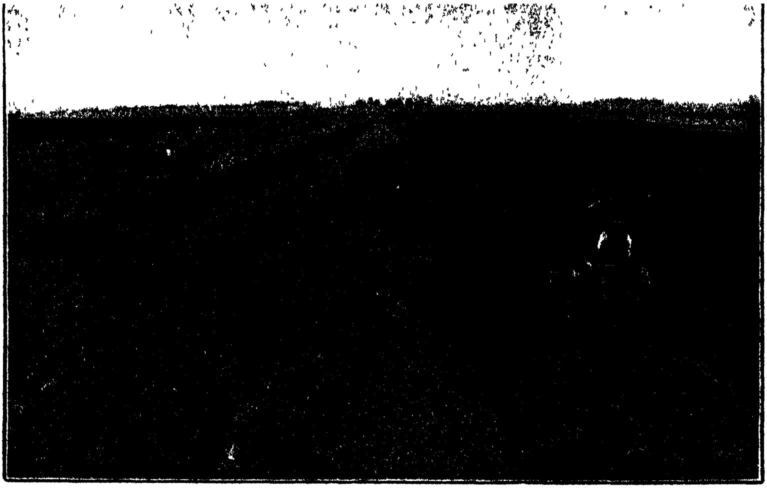
Gypsum exists in enormous quantities as surface deposits in northern Victoria, and in a form of a dry powder which does not require any preparation prior to its application to the soil.

Should further experimental work with lucerne fields in the Goulburn Valley and northern irrigation settlements confirm the results obtained at Werribee with respect to the use of gypsum supplemented by phosphates, there is every reason to believe that lucerne will become a most profitable and popular crop in the northern irrigated areas.

Acknowledgment.

Without the active co-operation of the officers of the Department of Agriculture, the carrying out of these investigations would not have been possible.

The writer desires to thank Messrs. A. M. Armstrong, C. Blazey, G. S. Gordon, and T. M. Whelan for assistance in recording weekly, and in some cases daily, losses by transpiration; Mr. R. G. Thomas for assistance in preparing data showing the relationship of wheat yield to rainfall, and Mr. L. C. Bartels for assistance in regard to the irrigation investigations. To Messrs. P. R. Scott and W. C. Robertson, of the Chemists' Branch, the writer is specially indebted for efficient aid in the chemical work involved throughout the investigations.



Harvesting Lucerne, State Research Farm, Werribee.

CONCLUSION AND SUMMARY.

The object of the investigations recorded in this paper was to determine, for Australian conditions, the amount of water required to elaborate a unit weight of dry matter for the principal farm crops and the influence of variety, season, varying moisture saturation, fertilizers, and physical environmental factors on the water requirements of crops.

The method adopted in studying the use of water by the crop was to grow the plants to that stage of maturity at which they are normally harvested in practice under controlled conditions in pots of sufficient capacity to allow normal plants to be grown.

The tests were conducted under field conditions at two centres—Werribee and Rutherglen—and under a glass pot culture house at Rutherglen.

The field tests were conducted for two seasons and the tests in the pot culture house for four seasons.

The pots used for the field tests were 15¾ inches in diameter and 27 inches deep, and held approximately 250 lbs. of moist soil. The pots used in the pot culture house were 9 inches internal diameter, 20.5 inches deep, and held 70 lbs. moist soil. In the field tests rain was not excluded. Evaporation from the soil was assumed to be equal to the evaporation losses from the bare fallow pots.

In the pot culture house rain was excluded and evaporation from the soil was reduced to negligible amounts by gravel mulches and the use of special subsoil watering devices. All field tests were conducted in duplicate and all tests in the pot culture house in triplicate. The water requirement determined under field conditions showed close agreement with the water requirements as determined in the pot-culture house during the same season.

1. The average Transpiration Ratio for farm crops at Rutherglen for a period of four years was:—Peas, 344; barley, 350; wheat, 380, oats, 390; mustard, 414; rye, 421; rape, 490; vetches, 593, lucerne, 790.5.

2. The average Transpiration Ratios for grain for four seasons was: —Peas, 673; barley, 926; wheat, 1,088; oats, 1,190, rye, 1,525.

3. The Transpiration Ratio is not a constant and definite quantity for any given crop, but it varies from season to season, and from locality to locality, due to natural climatic differences. It also varies with the period of the year during which the crop is grown.

4. A consistent relationship has been established between the Transpiration Ratio of a crop and the rate of evaporation from a free water surface during the period of maximum transpiration.

5. The transpiration rate increases exponentially during the early stages of a crop and reaches a maximum shortly after flowering. For winter-grown cereals, this period of maximum transpiration occurs in Australia during October. The period of maximum transpiration usually coincides with the combination of greatest heat, lowest humidity, and greatest wind velocity during the growing period of the crop. With winter-grown wheat no less than 40 per cent. of the total moisture used by the crop was transpired during October and over 80 per cent. from September to November, notwithstanding the fact that the period of growth extended over seven and a half months. Lucerne, at the flowering stage, transpired as much as 25 to 29 per cent. of its total water requirements within a three-day period. Hence the intensity of the physical environmental factors during this maximum transpiring period largely determines whether the Transpiration Ratio will be high or low.

6. High water requirements are associated with intense evaporation during the period of maximum transpiration. This intense evaporation represents the summation of the effects of high air temperature, low atmospheric humidity and wind velocity. Conversely low water requirements are associated with cool, humid, wind-still conditions during the period of maximum transpiration. As localities and seasons vary considerably with respect to the intensity of the physical environmental conditions during this period of heavy transpiration the Transpiration Ratios must necessarily vary.

Thus the average transpiration for cereals in a typical drought year at Rutherglen was 546 as compared with 273 for a favorable season.

A difference of 121 per cent. in the evaporation rate for the month of maximum transpiration and of 70 per cent. in the evaporation rate for the three months September to November, caused a difference of 100 per cent. in the Transpiration Ratio for the two seasons. A difference of 44 per cent. in the rate of evaporation during October, 1914, at Rutherglen and Werribee, caused a difference of 44 per cent. in the water requirement per pound of dry matter.

Summer-grown wheat at Werribee required 65 per cent. more water to produce a pound of dry matter than winter-grown wheat of the same variety. The rate of evaporation during the month of maximum transpiration was 69 per cent. higher with summer-grown wheat than the evaporation for the corresponding period with winter-grown wheat.

The water requirements of eight crops tested at Rutherglen over four seasons showed variations which corresponded very closely with the rates of evaporation during the period of maximum transpiration.

7. As we pass from the southern coast line of Australia to the interior—(*a*) Rainfall diminishes, (*b*) humidity decreases, (*c*) air temperatures increase, (*d*) evaporation rapidly increases. Hence crops raised in the arid regions are likely to suffer from the double disadvantage of shortage of rainfall and a high Transpiration Ratio.

8. The different varieties of wheat do not vary widely in regard to the quantity of water required to elaborate a unit of dry matter. They do vary considerably in the amount of water required to produce a unit weight of grain, because the proportion of grain to straw varies considerably with the variety. Thus with six varieties of wheat tested, the Transpiration Ratio for grain varied from 660 for Yandilla King to 1,188 for Kubanka. This point is of practical significance in the breeding of wheat varieties for arid areas. The migration ratio is a factor of importance in the creation of new varieties for arid localities, for this determines whether the variety will utilize the scanty water supplies economically or wastefully in the production of grain.

9. The Transpiration Ratio for wheat does not vary greatly with degrees of soil saturation, ranging from 30 to 90 per cent. of the water-holding capacity, but, on the whole, the water requirement for dry matter is greater in moist than in dry soil, and is lowest for soils maintained at moderate degrees of soil-saturation (45 per cent. of W.H.C.) The water requirement for grain, however, consistently and markedly increases as the degree of soil saturation increases, and the migration ratio rapidly diminishes with increasing soil humidity.

10. The application of artificial manures produced a marked lowering in the water requirement of wheat. The unmanured control plots showed a 29 per cent. higher water requirement than did plots treated with a normal dressing of complete minerals, and 39 per cent. higher water requirement than the plots treated with a heavy dressing of complete minerals. Nitrogen produced the greatest relative reduction in the Transpiration Ratio for dry matter.

When nitrates are available in abundance (as in well-worked fallows) the addition of a soluble phosphate not only increases the vigor of the crop, but materially lowers the Transpiration Ratio, and thus brings about a more effective utilization of soil moisture.

The effect of a suitable manure in aiding the plant to economize water supplies is an important factor in relation to the control of the Transpiration Ratio.

11. From a review of all the data, it is concluded that the absorption of mineral nutrients is independent of the absorption of water.

The composition of the soil solution is not constant, but is dependent on the mode of combination of the phosphoric acid and potash in the soil, and on the amount of nitrates present in the soil, all of which are affected by the fertilizer supply.

An increase in the density of the soil solution resulting from excess dressings of mineral nutrients was accompanied by an increase in the amount of mineral nutrients taken in by the plant per unit of water transpired, and by a material reduction in the Transpiration Ratio.

12. Transpiration is essentially evaporation of moisture from a wet leaf surface, and variations in temperature, humidity, and air movements, which increase or decrease evaporation, produce a similar effect on the plant.

The rate of transpiration depends on the moisture supply of the leaf and the evaporating power of the atmosphere, and this latter is a constantly fluctuating quantity owing to variations in temperature, humidity, and rate of air movement.

The rate of transpiration cannot therefore be regulated through the density of the soil solution, though the Transpiration Ratio may be materially reduced by liberal use of fertilizers.

13. The reduction in the Transpiration Ratio in a liberally manured soil is due to the more vigorous growth of the crop rather than to a reduction in the rate of transpiration, for on such soils the crop is increasing in dry matter in an economical manner throughout the whole of the time it is transpiring water. On the unmanured soil growth is retarded, but transpiration is continuous, so that the water cost of the dry matter produced is necessarily high.

Any factors which aid in the more perfect development of a crop—well tilled soil, use of appropriate fertilizers, good moisture supply, seeding of the crop under favorable conditions, good drainage and aeration—will enable crops to produce dry matter economically.

14. The composition of the crop is materially affected by the fertilizer applied. The most significant changes are caused by nitrogen. Heavy dressings of nitrogen greatly increase the nitrogen content both of the grain and the straw of wheat. The increase in the nitrogen content of the grain is accompanied by a marked reduction in the phosphate content, and a lesser reduction in the potash content.

The potash content of the straw is increased and the phosphate content reduced by heavy dressings of nitrogen.

15. The Transpiration Ratio of farm crops is profoundly influenced by the season. In a season of low annual rainfall, with hot, dry, windy weather at the critical period of maximum transpiration, a given crop will show a higher water requirement than in a season with cool, humid weather during the same period. The rate of evaporation from a free water surface during the period of maximum transpiration is an index of the water requirement of the crop.

A knowledge of the rate of evaporation from a free water surface is thus as important as a knowledge of the rainfall and its incidence in determining the suitability of arid lands for settlement.

16. The water requirement of lucerne is not constant, but varies with the locality, the season, and the period of the year at which it is grown.

17. The Transpiration Ratio for lucerne varied with the degree of soil saturation. At moderate degrees of soil saturation (60 per cent.) the water requirement was lower than with either extreme soil humidity (90 per cent W.H.C.) or extreme dryness (30 per cent. W.H.C.).

18. In field tests the water cost of dry matter produced varied materially with the amount of irrigation water applied.

Lucerne produced dry matter at lower water cost with moderate irrigations (24 to 30 acre inches) than with either heavy irrigations or no irrigation.

19. The yield of lucerne varied directly, but not proportionally with the water supply up to the limit of 48 acre inches of irrigation water.

20. Superphosphate produced a marked increase in lucerne yields, and a marked lowering in the water cost of dry matter produced.

21. A lucerne crop yielding seven tons of dry matter per acre removed from the soil 65 lbs. of phosphoric acid, 321 lbs. nitrogen, and 348 lbs. of potash.

Lucerne, therefore, removes from the soil five times as much phosphoric acid, nine times as much nitrogen, and 36 times as much potash as a 30-bushel wheat crop.

22. The application of gypsum resulted in a substantial and profitable increase in the lucerne yield. The beneficial effect of gypsum is probably due, not to the liberation of potash, but to its effect in improving the texture and permeability of the subsoil

Increased aeration, better drainage, and more rapid movement of the subsoil water result, and the conditions for plant growth are improved.

The results obtained at Werribee suggest that the texture of the stiff clay subsoils in the northern irrigation districts could be greatly improved at relatively small cost by the application of liberal dressings of gypsum.

23. The Transpiration Ratio determined for wheat postulates that with moderate rainfalls, each inch of rain received during the growing period of the crop is capable of producing 3.54 bushels of wheat.

24. A close relationship has been found to exist between the average wheat yield of South Australia and Victoria and the average composite seasonal rainfall.

For the past decade South Australian farmers reaped .94 bushel, and Victorian farmers 1.09 bushels of wheat for each inch of seasonal rainfall.

As the average seasonal rainfall for the wheat belt of the two States is 11½ inches, the maximum possible wheat yield would be 40 bushels per acre for the two States.

25. In the Wimmera district, where cultural methods have greatly improved during recent years, the average yield for the past decade, expressed in terms of rainfall, is 1.43 bushels per inch of seasonal rain. For the past five years 1.68 bushels of wheat have been obtained for each inch of rain.

On the Longerenong Agricultural College farm an average of 3.5 bushels per inch of seasonal rain has been obtained during the past five years. On two private farms in the Wimmera yields of 3.48 bushels per acre and 3.6 bushels per acre have been obtained during the same period.

26. The production of new varieties of wheat to meet the requirements of a low transpiration rate opens up a field of vast possibilities. Earliness of maturity and high migration ratio are of great importance in the production of wheats for arid localities.

27. Hybridization is the most promising method of producing early maturing, prolific varieties, with high migration ratio. Early maturity and late maturity behave as a pair of Mendelian unit characters. Crosses made between wheats of high yielding and low yielding strains showed distinct segregation in the F_2 generation into high and low yielding variants.

Centgener tests with F_3 families showed that the high yielding variants gave an average increase of 25.2 per cent. over the corresponding families derived from low yielding segregates.

28. A fixed cross-bred barley obtained by crossing Pryor with Skinless showed in centgener plots a 29 per cent. increase, and in field plots a 28 per cent. increase in yield over the highest yielding parent.

29. Gallipoli wheat, a cross-bred produced by the writer by crossing Clubhead and Yandilla King, has given consistently higher yields in field tests than either Federation or Yandilla King, the two standard varieties of the wheat belt.

In this variety earliness of maturity, high migration ratio and high yielding capacity have been combined.

30. As unit characters in wheat are independently inherited in accordance with the Mendelian law, it is possible to associate in one variety any combination of desirable unit characters.

The mode of inheritance of certain botanical characters has been worked out, but the determination of the factors which compose the mosaic of prolificness, drought resistance and low water requirements remains to be determined. With the evolution of harder strains with low water requirements, new territories may be subjugated and the utilization of existing areas may be made more effective.

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PASSION FRUIT CULTURE IN VICTORIA.

(Continued from page 412.)

By J. Farrell, Orchard Supervisor.

XII.—Habit of Leader and Lateral Growths, and Mode of Producing Fruit Buds.

When the young vines are systematically tied up on the trellises, and growth commences in the spring, the leaders, aided by their tendrils, extend by creeping along the horizontal wires. At this time the advantage of good cultivation and manuring become manifest, and as it is desirable to obtain the most vigorous growth possible, this condition should be maintained until the end of the growing period. Most other kinds of fruit trees that make early vigorous growth rarely come into bearing as soon as those of weak or normal development. This, however, does not apply in the case of the passion vine; on the contrary, vigorous growing young plants show the desired precocity, and continue to bear heavier and more consistently than less robust or weakly ones, and the fruit is larger and generally of better quality.

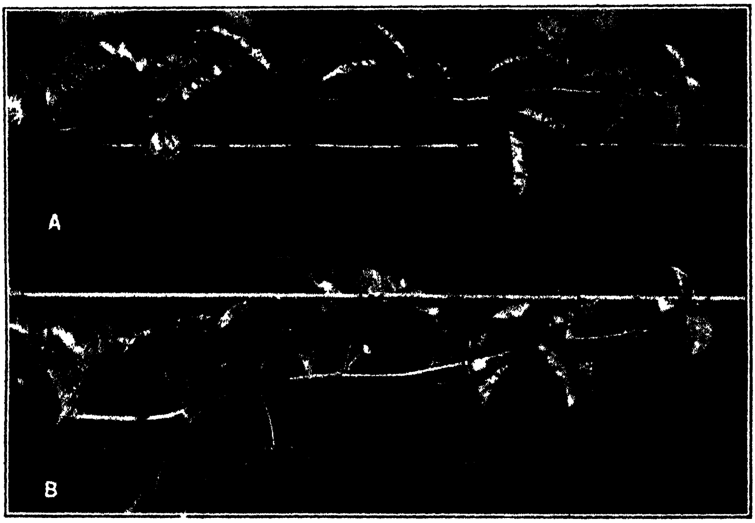


Fig. 25.—Habit of leader growth.

The sections of the two leaders, with their alternate lobed leaves, illustrated in Figure 25, are typical of these growths. The leader (A) is shown in the natural and comfortable position which these growths like to assume, "walking" along the wire, and in this way all the tendrils are utilized in clasping same. It will be understood that, while young, the tendrils are soft, pliable, and pendulous, coming early into contact with the wire, which they lay hold of as shown. Leader (B) is in a less favorable position in relation to the wire from which it is suspended, and for the reasons explained, is deprived of the service of some of its tendrils. It generally happens, however, that the growing point of a leader like this gradually rises above the wire, and the further extension assumes a position like (A). The desirableness of obtaining the best method of lateral growth is a further reason for careful and systematic treatment of the vine at the tying-up, when the fan-shape may be established and its permanency secured.

When a vine is of prolific character, and growth commences in the spring, a high percentage of blossoms appear, but many of these do not set fruit. The blooms, as well as the tendrils, are produced singly, one flower and a clasper appearing in each leaf-axil, although often either or both may be missing. The blossoms and tendrils are produced during the currency of the growth of the yearling wood, and these rarely begin to appear until the leader or lateral, as the case may be, has extended beyond the fourth or fifth node from its base on the older wood. Although the leaders are fruitful while young, the laterals are usually more prolific. This may be seen by comparing the present weaker condition of the yearling lateral and its apparent impending florescence depicted in Figure 26, with the more virile but less floriferous leader growths appearing in the immediately preceding illustration. Both lateral and leaders were taken from the same vine.

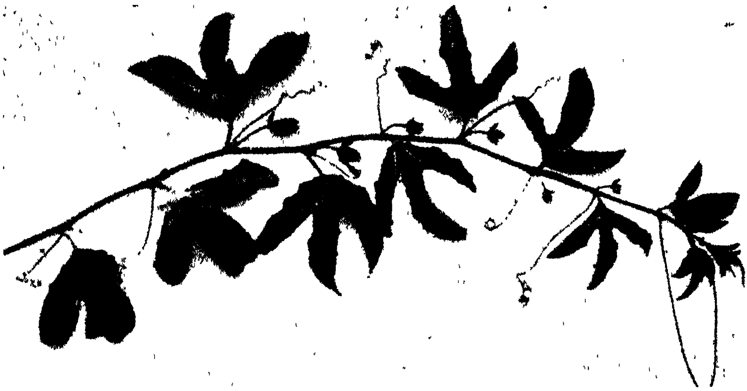


Fig. 26.—A fruitful lateral.

The leaders and laterals extend during succeeding years by continuous growth from the terminal buds, whereas the sub-leaders and sub-lateral growths come from buds formed in the leaf-axils, with the flowers and tendrils on the previous year's wood. A high percentage of these buds gives out relatively short growths, all of which are capable of yielding fruit. Now we more clearly realize the necessity of pruning, as in the case of other vines and fruit trees, to regulate their length and maintain the proper number of these growths. Owing to past neglect in this regard, the urgent necessity of pruning to obtain the highest number of fruits of the finest quality and to relieve the vines of the burden of supporting numerous, superfluous, willowy growths cannot be too frequently reiterated.

XIII.—Blooming, Pollination, Setting, Development, and Ripening of the Fruit.

The passion flower is so named because of a fancied resemblance of the parts of the flower to the instruments of Christ's crucifixion. The corona represents the crown of thorns, the stamens and pistils the nails of the cross, while the five sepals and five petals stood for the ten faithful apostles.

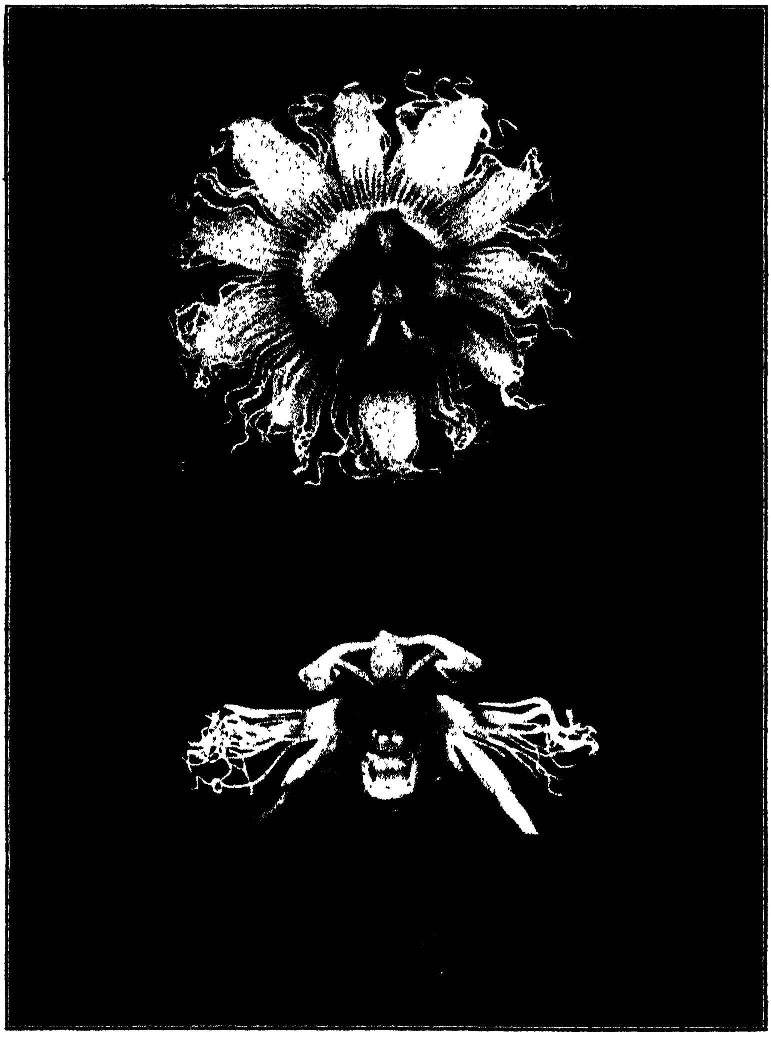


Fig. 27.—The Passion flower (*passiflora edulis*) natural size.

Weather and other conditions being favorable, passion vines produce two crops of fruit each year. The first crop ripens in February or March and the second during June or July. In some places, and during certain seasons, however, cropping is almost continuous from February to July or August. Unpruned plants bloom sooner and ripen their first fruits earlier than pruned vines. The blossoms from which the early fruits mature usually appear in November, and those for the later crop in March or April. Now it will be seen that pruning, to a great extent, regulates the time of ripening, and consequently, marketing of the fruit. Early ripening passions and the last fruits of the season bring the highest prices on account of the scarcity of fruit at these times; whereas, lower returns are accepted for those ripening in the interim, when gluts sometimes occur.

The frontal view of the passion flower (natural size), illustrated in Figure 27, is typical of the variety under review, and the vertical section appearing under same further shows the botanical construction of the flower and the relation of its organs to each other. These illustrations fully serve the purpose for which they are intended; but the camera, although showing the tracery of this exotic beauty, fails to fully depict the delicate loveliness of its colour, shade and blend. The pistil is in three divisions, the stigmas of which incline towards, and come into contact with the partly revolving anthers, as shown in both illustrations, thus insuring perfect pollination. Bees like to frequent these flowers, and while in search of the nectar, they cause the anthers to swing round and brush the pollen, with which these are abundantly supplied, on to the stigmas. Up to the present, this variety has not shown any need for cross-fertilization, but, possibly, the introduction of pollen from the Mammoth passion, which is in every respect similar to the commoner passion, except that the plant grows stronger and produces larger fruits, would cause the setting of even heavier crops. The Mammoth is in itself a shy bearer, but we are not to infer from this that its pollen would be unsuitable for crossing with the common black. We have evidence of two varieties of pear trees, both of which were self-sterile, but when brought into contact with each other, both became highly fruitful through the influence of interpollination. When fertilization is successful, the outer organs of the flower dry up and

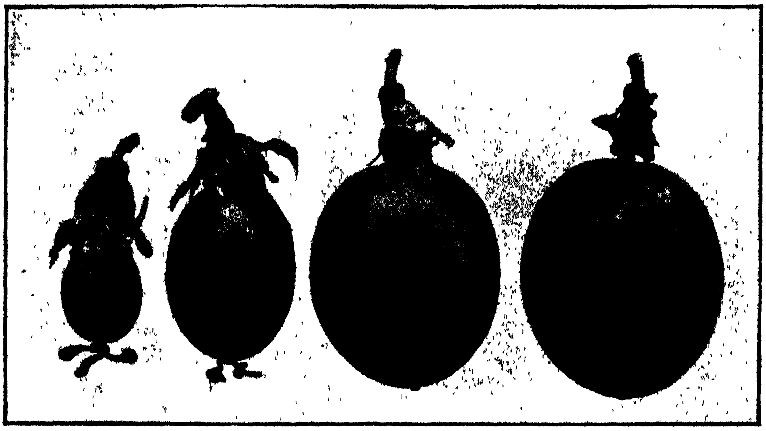


Fig. 28.—Showing development of the fruit.

gradually shrivel, while the young egg-shaped fruit, as shown in the section, develops. Most of the flowers appear during the mild or warm weather; but, even in winter when the atmosphere is cold, crisp, and clear, many of these attractive flowers may be seen nestling among the green foliage.

Figure 28 illustrates four later stages in the fruit's development up to the time of ripening, and these are shown about two-thirds natural size. All the withered outer organs of the flower are still attached to the young fruit on the left, and the organs are more withered on the larger fruit next to this. The remains of the pistil have disappeared from the next fruit which is fully grown, and the fourth, ripe specimen, has practically shed the last shred of its original floral ornamentation. The fruit, on arriving at the ripe stage, should be picked off and marketed as soon as possible; if not, it commences to wilt, drop on the ground and deteriorate in value. Although the contents of wilted fruit is the more palatable, retailers like to stock passion fruit before this condition is reached, because, when wilting commences it proceeds rapidly, and, when the demand is slow, the fruit often shrivels before it can be distributed; therefore, higher prices are obtained by the grower for fresh fruit.

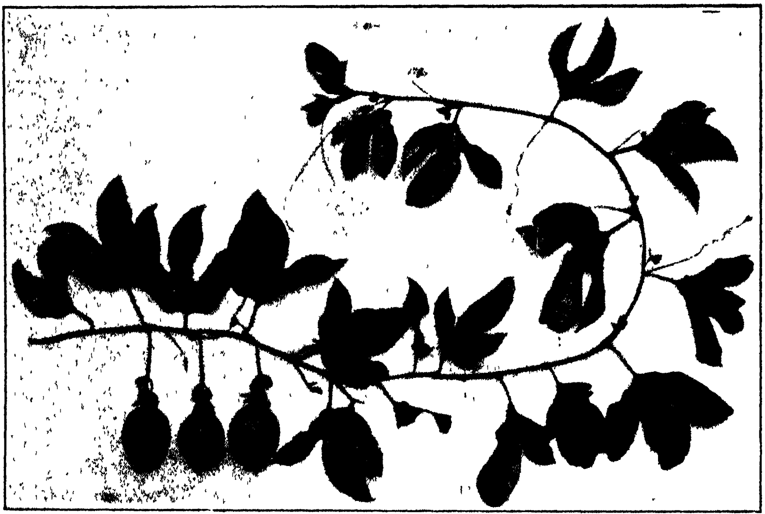


Fig. 29.—Shows lateral with three fruits matured—one at each consecutive node.

The fruits may be produced at consecutive nodes, or alternately along a leader or lateral, and as many as ten or twelve appearing in the former order is of common occurrence in certain seasons when growing conditions are most favorable.

Figure 29 shows a lateral having ripened three fruits consecutively near its base, then several nodes missed, and blooming began again later in the season, as may be observed in the illustration; but these flowers dropped from their cups, a matter which will be further dealt with under the heading of "Sterility." Some laterals strike off from the leaders at right angles to the trellis, and in this position have little or no support. These pendulous growths are usually less fruitful than those which follow the line of the trellis and find a hold for their tendrils. In reducing the number of laterals at the pruning, these should be the first removed.

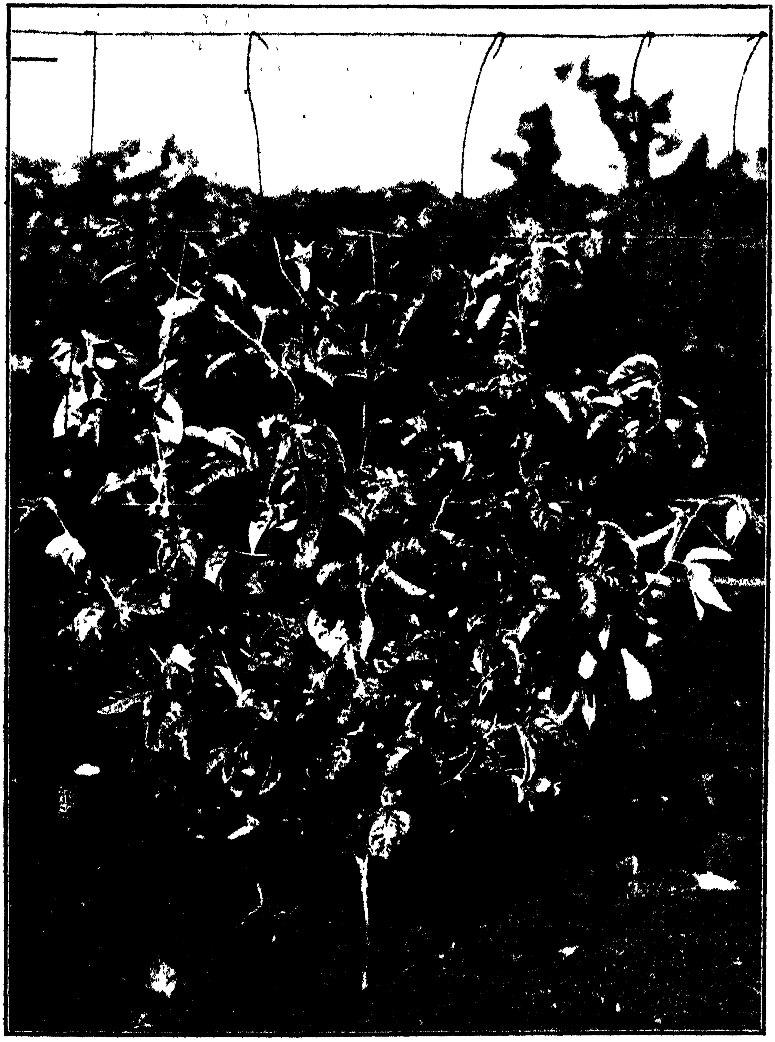


Fig. 30.—A two-year-old Mammoth passion vine.

XIV.—The Mammoth Passion.

This sub-variety—which was probably evolved from *P. edulis*, and introduced from other States of the Commonwealth into Victoria—is now being fairly extensively planted here. While young, particularly, it makes much stronger growth, and its leaves and fruits are one-third or more larger than those of the common passion. Its requirements in respect to climate and soil are similar to those of the latter. It is also propagated in like manner, and as regards planting, cultivation, manuring, pruning, &c., the best results accrue when these details are carried out on the lines previously explained. Up to last year (1922) neither the area under its cultivation, nor the duration of same, was sufficient to afford adequate data on which to warrant the recommendation of its permanent adoption. Some of the young vines planted here bear fairly well, but in many there seems an inherent tendency to shy bearing.

The Mammoth fruit is nearly round, large, and attractive, and when ripe its colour is also dark purple. On a few occasions in the past exceptionally strong growing plants, like the Mammoth, have been raised from the ordinary passion seeds. These made strong growth for a few years, and during that period produced large fruits. When growth became steadier and regular heavy cropping commenced; however, the characteristics of these vines in every respect reverted to those of the parent—*P. edulis*.

Several growers have planted out some Mammoth plants, mostly for experimental purposes, and as far as the experiments have gone, many have their doubts as to whether its cultivation will prove as profitable as that of the common black.

Figure 30 shows a two-year-old Mammoth vine, which, although having made good growth, is much less fruitful than the smaller black passions of the same age growing in the same garden. So far the Mammoth has proved highly resistant to pests and diseases; but, for the reasons mentioned, growers contemplating planting this variety extensively would be well advised to proceed cautiously and watch for the results of experiments already undertaken.

(To be continued.)

PROHIBITION OF REMOVAL OF BEES.

By a proclamation under section 4 (1) of the *Bees Act* 1915, dated 13th June, 1923, the municipal districts of Stawell (Borough), and Dimboola, Mount Rouse, Ripon, and Stawell Shires have been declared "Proclaimed Areas," and by regulations made under the same section, the bringing of bees into or the sending or removing of any bees, hives containing bees, used or second-hand hives, used or second-hand comb, or appliances from those areas has been prohibited, unless permission to do so has first been obtained.

Forms of application for permits may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne.

BROWN ROT OF STONE FRUIT.

SPRAYING EXPERIMENTS.

Copy of Report by A. A. Hammond, Orchard Supervisor.

Bordeaux Mixture v. Lime Sulphur.

Last season further experiments were made in the value of spraying for the control of the brown rot fungus (*sclerotinia fructigena*). On this occasion experiments were conducted at Croydon, in the orchards of Mr. S. Hardidge and Mr. H. Smith.

Condition of Twyford blooms when sprayed with Lime Sulphur (1 in 20) on 14th September.

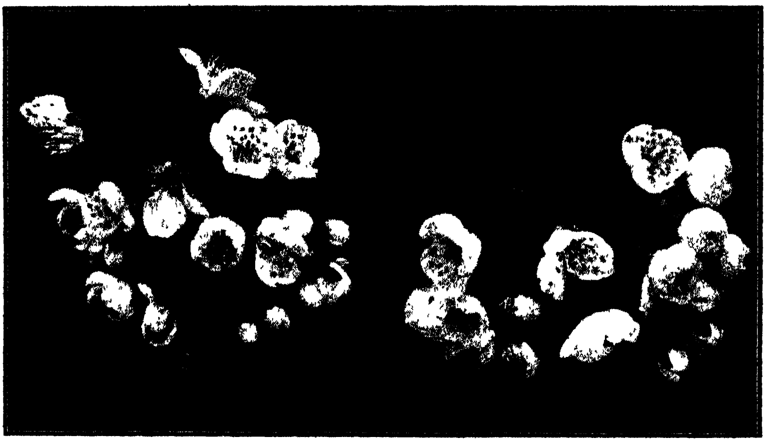
The main object of the experiments at Mr. Hardidge's orchard was to determine the value of Bordeaux Mixture as compared with Lime Sulphur for the control of the disease.

Five trees in each of two adjoining rows in the centre of the cherry patch were chosen. The varieties chosen were Twyford Biggareau, Bedford Prolific (ten trees in each case), and Florence (two trees). The trees selected appeared to be an even lot in size and shape.

The Twyford is usually the most susceptible to the disease, but the Florence is also very subject to infection when rain falls just before harvesting time. The Bedford appears to be the least liable to the disease, and in the experiments under notice there was practically no disease observed in this variety.

Some of the trees received two spray applications, some three, and some four, and in some instances the Woburn Bordeaux Mixture was substituted for the Sulphur Casein spray, in order to ascertain, if possible, the relative efficiency of these sprays for the final application.

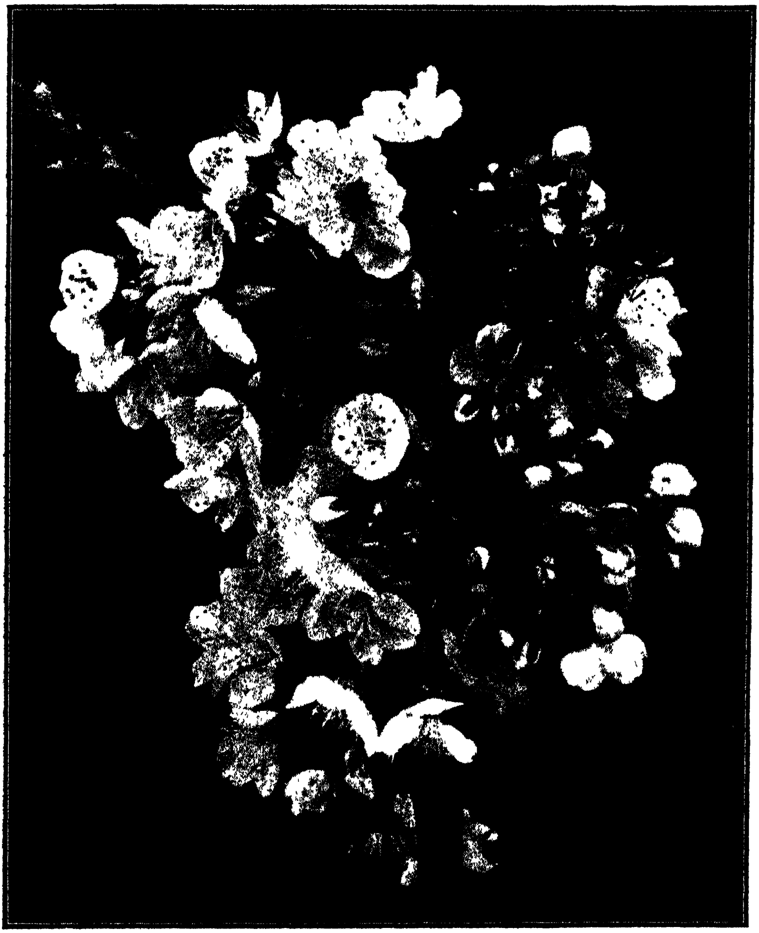
The outstanding feature of the experiments was the superiority of the Lime Sulphur spray as compared with Bordeaux Mixture.



Condition of Twyford blooms when sprayed with Lime Sulphur (1 in 25) on 28th September.

The blooms and fruit were carefully checked on trees 3 and 4 (Twyford). These trees were of about the same size and shape. No. 3 received three sprayings of Copper Sulphate solutions whilst No. 4 was treated with the Sulphur sprays on the same dates. The results are shown in the table herewith. Trees Nos. 9 and 10 (Florence) also showed the superiority of the Lime Sulphur over the Bordeaux Mixture. Both these trees were treated with Lime Sulphur in the first spray, but on the second spraying No. 9 was treated with Bordeaux and No. 10 was sprayed with Lime Sulphur. No disease was apparent in either of these trees early in November, but towards the end of the month it showed up badly in the one sprayed with Bordeaux on the 25th October, whilst the tree treated with Lime Sulphur on the same date was comparatively clean. The cherries from these trees were harvested on 12th December. On 9th December there had been 29 points of rain, and on 10th 17 points.

No check trees were left in this orchard, as Mr. Hardidge suffered so severely from the ravages of brown rot the previous season that he would take no risk. I may mention that Mr. Hardidge sprayed the whole of the cherry and plum trees in the orchard with Lime Sulphur and Sulphur Soda, his experience of Bordeaux in the previous year (1921) being most unsatisfactory. The results of his spraying in the past year (1922) were entirely satisfactory, his loss being less than 10 per cent. as compared with 50 per cent. of the previous year.



Condition of Burgdorf blossoms when sprayed with Lime Sulphur (1 in 20) on 22nd September.

The Best Time to Spray.

In the experiments carried out at Mr. H. Smith's orchard, at Croydon, the Lime Sulphur spray only was used. The main purpose of these experiments was to ascertain the best time to apply the first spray.

Some trees were sprayed when about 10 per cent. of the blooms had opened, some when 50 per cent. had opened, and others when the trees were in full bloom. In the case of an Early Purple Guigne, which was sprayed with Lime Sulphur (1 in 20) on 14th September when in almost full bloom, no trace of burning was noticeable. Burgdorf's Seedling and Black Biggareau sprayed at the same strength a week later, when in about the same condition, showed evidence of burning, the petals turning brown. A light crop set on the trees, which showed burning.

It was remarkable, however, that a Burgdorf's Seedling left as a check was rather badly affected with the brown rot fungus, while the sprayed trees were almost free from disease. The Burgdorf's were sprayed with Lime Sulphur (1 in 20) on 22nd September. The trees next the check tree were examined on 5th October and compared with the check tree. On the unsprayed tree 70 blooms were diseased. The blooms on the two trees next the check tree were examined, and on one two blooms were diseased and on the other no affected blooms could be found. On 22nd November, just before picking, the trees under notice were again examined. On the check tree 28 diseased cherries were found. On the sprayed trees the whole of the fruit was quite free from disease.

Cherry Blossoms affected with Brown Rot Fungus.

The results obtained from the trees first sprayed, when 10 per cent. of the buds had expanded, were as good as those from the trees to which the first application was made, when 50 per cent. of the blooms had opened.

As mentioned previously, Lime Sulphur used on Burgdorf's at a strength of 1 in 20 caused burning. A mixture of 1 in 25 sprayed on

Twyford's a week later, when half the blooms had opened, did not cause the slightest injury.

The result of the experiments would seem to indicate that the best time to apply the first spray is when about 10 per cent. of the blooms have expanded, but if rain threatens, it is better to defer the first application, and to spray immediately the weather becomes fine.

The Sulphur Casein and Woburn Bordeaux sprays mentioned above were made in accordance with directions given in this *Journal* of March, 1922. Commercial Lime Sulphur .33 deg. Baumé was used throughout. The Bordeaux Mixture was made from Macclesfield bluestone and good lump lime.

Although in the previous season's experiments no appreciable difference could be observed between the results from trees sprayed with Bordeaux and Lime Sulphur, the results of the experiments at Mr. Hardidge's orchard proved the superiority of the Lime Sulphur as a spray for brown rot.

TABLE OF SPRAYING EXPERIMENTS FOR THE CONTROL OF BROWN ROT IN CHERRIES, CONDUCTED AT MR. S. HARDIDGE'S ORCHARD, CROYDON.

Tree Number and Variety	Mixture used	Strength	Date of Application.	Number of blooms affected.	Number of fruits affected.	Percentage clean fruit harvested and quantity in lbs.	Remarks.
(1) Twyford	Bordeaux ..	6.6.40	Sept. 14 Nov. 8	Not counted	545	44 lbs., 88.9	About 10 per cent. of flower buds open on 1, 2, 3, and 4
(2) Twyford	Lime Sulphur Woburn Bordeaux	1 in 10 1 in 11 1 in 32 ..	Aug. 15 Sept. 14 Oct. 25 Nov. 8	Not counted	263	22 lbs., 89.3	Small tree
(3) Twyford	Bordeaux .. Woburn Bordeaux	6.6.40 3.3.40 ..	Sept. 14 Oct. 27 Nov. 8	134	725	33 lbs., 81.9	Nos. 3 and 4 trees much alike in every respect
(4) Twyford	Lime Sulphur Sulphur Casein	1 in 11 1 in 32 4 to 40	Sept. 14 Oct. 25 Nov. 8	65	103	55 lbs., 98.1	
(5) Bedford	Bordeaux .. Sulphur Casein	6.6.40 3.3.40 4 to 40	Sept. 14 Oct. 27 Nov. 8	Not counted	.		Showed very little disease
(6) Bedford	Lime Sulphur Woburn Bordeaux	1 in 11 1 in 32 ..	Sept. 14 Oct. 28 Nov. 8	..	..	.	Negative results, there being no disease showing of any consequence
(7) Bedford	Bordeaux .. Woburn Bordeaux	6.6 40 ..	Sept. 14 Nov. 8	..	.	..	The result of spraying. Negative in 7 and 8. No disease showing
(8) Bedford	Lime Sulphur	1 in 11	Sept. 14				
(9) Florence	Lime Sulphur Bordeaux ..	1 in 20 3.3.40	Sept. 14 Oct. 25	No infected blooms noticeable	402	55 lbs., 94.2	
(10) Florence	Lime Sulphur	1 in 20 1 in 32	Sept. 14 Oct. 25	No infected blooms noticeable	61	44 lbs.. 98.6	

POULTRY FEEDING EXPERIMENT.

W. C. Rugg, Poultry Foreman, State Research Farm.

An experiment to test the advisability of allowing birds free access to food at all times as compared with the ordinary practice of feeding at regular intervals, was conducted at the State Reseach Farm, Werribee, during the twelve months ended the 31st March, last.

Seventy-two White Leghorn pullets, each of quality about equal to that of an ordinary farm flock (none of the birds chosen was from a single mating) were divided into two lots of 36 each, and each pen was given food of the same ingredient throughout the year.

Food Used.

The birds in both pens were given dry mash in hoppers which were open at all times. This mash consisted of—bran and pollard, equal quantities by measure; meat meal, 10 lbs. to every 100 lbs. of bran and pollard, and about 3 per cent. powdered charcoal. In addition, a grain mixture of three parts Algerian oats to two parts wheat was fed to each pen.

To No. 1 pen the grain was fed in a hopper always open, and the birds were allowed green stuff, whole not chaffed, from a wire basket which was kept well supplied.

The birds in No. 2 pen had their grain scattered in the litter and chaffed green-stuff was fed them at mid-day.

In order that the results might approximate to those that would have been obtained had the experiment been conducted on an ordinary farm, no other feed than that mentioned, which is obtainable almost anywhere in the State, was given the birds. A variety would have been greatly relished by them, and would probably have increased the egg-production, but as oaten pollard, barley, pollard pea-meal, bullocks' livers, &c. are not easily procurable by a large number of settlers at a distance from the metropolis, none of these were fed to the birds.

The green-stuff used was green barley, rye grass, and rape during the winter months, and lucerne all the summer. Minced raw onions were fed once a week—about three-quarters of a lb. to each pen. Epsom salts and sulphur were used when thought advisable. Shell grit and granulated charcoal were always available, and a dust bath was provided in each pen.

Housing.

The birds were housed in a corrugated iron shed facing east. Each pen had a floor space of about 260 square feet—a little over seven square feet to the bird—and they were kept in the pen throughout the test, no outside run being made available. The floor was covered with from 4 to 6 inches of litter. Droppings boards were used underneath the perches.

Health of the Birds.

The general health of the birds was good throughout the test.

In No. 1 pen (continuous feeding) one bird became blind, and two went light; these three were destroyed.

In No. 2 pen one bird was found dead, one died from crop trouble, and one contracted disease and was destroyed.

FOOD CONSUMED AND ITS COST.

—	Pen No. 1 —Continuous Feed.						Pen No. 2 —Regular Feeding.					
	Quantity.	Price.	Value.				Quantity.	Price.	Value.			
		s. d.	£	s.	d.			s. d.	£	s.	d.	
Bran ..	16¾ bus.	1 10 per bus.	1	10	8½		17½ bus.	1 10 per bus	1	12	1	
Pollard ..	28 bus	1 10 per bus.	2	11	4		29½ bus.	1 10 per bus.	2	14	1	
Meat Meal	88 lbs.	0 2 per lb.	0	14	8		93 lbs.	0 2 per lb.	0	15	6	
Oats ..	22¾ bus.	4 0 per bus.	4	11	0		28 bus.	4 0 per bus.	5	12	0	
Wheat ..	12⅓ bus.	6 2 per bus.	3	16	0½		12½ bus.	6 2 per bus.	3	17	1	
	..	..	13	3	9		..	..	14	10	9	

EGGS PRODUCED AND THEIR VALUE.

Month	Price of eggs per doz.		No. 1. Pen.—Continuous Feed.								No 2 Pen —Regular Feeding.							
			Number of Birds.	Eggs laid.	Value.			Production per Bird.			Number of Birds.	Eggs laid.	Value.			Production per Bird.		
1922.	s.	d.			£	s.	d	£	s.	d.			£	s.	d.	£	s.	d.
April ..	2	6	36	337	3	10	2½	0	1	11·4	36	283	2	18	11½	0	1	7·6
May ..	2	9	36	405	4	12	9¾	0	2	6·9	36	191	2	3	9½	0	1	2·6
June ..	2	2	36	500	4	10	3¼	0	2	6·1	36	385	3	9	6¼	0	1	11·2
July ..	2	4	36	514	4	19	11¼	0	2	9·3	36	509	4	18	11¾	0	2	9
August ..	1	4	35	642	3	11	4	0	2	0·4	36	662	3	13	6¾	0	2	0·5
September	1	4	33	706	3	18	5¼	0	2	4·5	36	690	3	16	8	0	2	1·5
October	1	3	33	717	3	14	8½	0	2	3·1	34	687	3	11	6¾	0	2	1·2
November	1	2	33	567	2	15	1½	0	1	8	34	562	2	14	7¾	0	1	7·2
December	1	3	33	547	2	16	11¾	0	1	8·7	33	491	2	11	1¾	0	1	6·6
1923.																		
January	1	5	33	482	2	16	10¾	0	1	8·6	33	540	3	3	9	0	1	11·1
February	1	7	33	352	2	6	5¼	0	1	4·9	33	392	2	11	8½	0	1	6·9
March ..	1	10	33	345	2	12	8½	0	1	7·2	33	279	2	2	7½	0	1	3·5
	..		34⅙	6,114	42	5	10¼	1	4	7	34⅔	5.671	37	16	11	1	1	8·9

Summary.

EGG YIELD AND FEED COST.

—	Average No. of eggs per Bird.	Return per Bird.			Cost of Feed.						Profit over Cost of Feed.	
					Mash.		Grain.		Total.			
		£	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
No. 1 Pen (continuous feed)	179	1	4	7	= 2	11·2	= 4	9·4	= 7	8·6	= 16	10
No. 2 Pen (Regular feeding)	164	1	1	8·9	= 2	10	= 5	6 6	= 8	4·6	= 13	0½

It will be seen that the birds in No. 1 pen which had their food before them continuously throughout the twelve months, produced the largest number of eggs and showed the highest profit per bird. They made their greatest gain during the winter four months, April 1st to July 31st, the time at which eggs bring the highest price in Victoria.

During this period they cost a little over 4d. per bird more for feed, but returned about 2s. 3d. per head in value of eggs as shown in the following table.

EGG PRODUCTION AND FEED COST, APRIL 1ST TO JULY 31ST.

Pen.	No of Eggs	Value	Cost of Feed.		Total.	Profit over Feed.
			Mash	Grain.		
		£ s. d.			£ s. d.	£ s. d.
No. 1. Continuous	1,756	17 13 2¾	(318 lbs.) £1 11 3	(795 lbs.) £4 0 4½	5 11 7½	12 1 7¼
No. 2. Regular ..	1,368	13 1 3	(330 lbs.) £1 12 6	(670 lbs.) £3 7 9	5 0 3	8 1 0

One of the conclusions to be drawn is that pullets when starting to lay require more food than is usually given to them in early winter, as although the birds in No. 2 pen had a dry mash hopper always open and as much grain in the evening as they would pick up, those in No. 1 pen where food was always available consumed 113 lbs. more mash and grain for the four months.

The green feed was not weighed to the birds. It was noted that the birds in No. 1 pen consumed the greater quantity of this—a considerable amount of it just before going to roost—and although their basket was kept well supplied with fresh green-stuff (whole) every day, they would eat almost as much chaffed green-stuff at mid-day as the members of No. 2 pen which were given as much as they would pick up.

It is reasonable to conclude that this green-stuff taken by the birds in No. 1 pen the last thing at night, on an almost full crop of mash and grain, was an aid to digestion, and probably was an important factor in the higher egg-production.

Food Prices.

As most of the food used was grown on the farm, and the balance purchased in large quantities at wholesale rates, it was considered advisable to calculate cost of food on prices which were supplied by one of the leading poultry farmers in the State; they are as follows:—bran 1s. 10d. per bushel; pollard 1s. 10d. per bushel; oats 4s. per bushel; wheat 6s. 2d. per bushel.

Meat meal cost 2d. per lb.

Green-stuff was not taken into consideration.

MAIZE FEEDING EXPERIMENT.

It is the opinion of a number of people who keep poultry, that maize can be fed with safety only in the winter months, and that it is dangerous, or at least harmful to use it in summer.

To test the effect of feeding a high percentage of maize throughout the year, 36 birds of equal quality to those used in the above-mentioned experiment were housed in the same building and treated in an exactly similar manner except for the feed ration. This test, too, was for a period of twelve months. The birds in the pen were fed on dry mash, in hoppers always open, which was composed of maize meal, bran, and pollard, equal quantities by weight, to every 100 lbs. of which was added 10 lbs. of meat meal, and 3 lbs. of charcoal (powdered).

The grain ration which was scattered in the litter, consisted of three parts crushed maize and one of wheat. Chaffed green-stuff was fed at mid-day. There were three deaths; one bird went light and was destroyed in October; one was found dead in December; and one died of crop trouble in January. None of the complaints in these cases could be attributed to the maize. Otherwise the health of the birds was good throughout the year.

FOOD CONSUMED AND ITS COST.

Food.	Quantity.	Price.	Value.
		s. *d.*	£ *s* *d.*
Maize Meal	16½ bushels ..	2 4 per bushel	1 18 6
Bran	16½ bushels ..	1 10 per bushel ..	1 10 3
Pollard	16½ bushels ..	1 10 per bushel ..	1 10 3
Meat Meal	99 lbs. ..	0 2 per lb. ..	0 16 6
Crushed Maize	24½ bushels ..	6 0 per bushel ..	7 7 0
Wheat	7½ bushels ..	6 2 per bushel ..	2 6 3
			15 8 9

EGGS PRODUCED AND THEIR VALUE.

Month.	Price of eggs per doz.	No. of Birds.	No. of eggs laid.	Value.	Production of Birds.
1922.	*s.* *d.*			£ *s.* *d.*	£ *s.* *d.*
April	2 6	36	326	3 7 11	0 1 10·6
May	2 9	36	285	3 5 4	0 1 9·8
June	2 2	36	422	3 16 2	0 2 1·4
July	2 4	36	463	4 10 0	0 2 6
August	1 4	36	526	2 18 5	0 1 7·5
September	1 4	36	579	3 4 4	0 1 9·5
October	1 3	35	625	3 5 1	0 1 10·3
November	1 2	35	562	2 14 8	0 1 6·7
December	1 3	34	487	2 10 9	0 1 5·9
1923.					
January	1 5	33	398	2 7 0	0 1 5·1
February	1 7	33	391	2 11 7	0 1 6·8
March	1 10	33	372	2 16 10	0 1 8·6
		34 11/12	5,436	..	1 1 4

Summary.

Egg Yield and Feed Cost.

Average Number of eggs per bird	Return per Bird.	Cost of Feed.		Total.	Profit over Cost of Food
		Mash.	Grain.		
	£ *s.* *d.*	*s.* *d.*	*s* *d.*	*s.* *d.*	*s* *d.*
156	1 1 4	3 3·6	5 6·5	8 10·1	12 6

The result of this experiment tends to show that maize fed in conjunction with other foods can be used with safety at all seasons of the year.

As maize is now being grown in larger quantities each year in many parts of the State it is probable that it will prove economical as a grain food in districts in which it can be procured at a reasonable price.

The fact that these birds did not suffer in any way is reflected by their egg-production for the last two months of the test. A reference to the table of egg-production of the several pens shows that the maize-fed pen produced, during the months of February and March, five and a half dozen eggs more than the No. 1 pen (continuous feed), and seven and three-quarter dozen eggs more than No. 2 pen (regular feed).

POULTRY NOTES FROM THE RESEARCH FARM.

(*By W. Pederick, Poultry Foreman.*)

There has been a heavy demand from the public for eggs for hatching purposes.

Hatching operations at the Farm are now in full swing. About 600 chicks were hatched in July, and are now doing well in the brooder house.

All chickens are hatched in pedigree trays and toe marked; this entails extra work, but is the only way of keeping an accurate record of the breeding of every bird reared on the Farm.

August is the busiest month for hatching, and the incubators are now full.

The fertility so far has been good, particularly so with White Leghorns, which is not usual so early in the season, especially when the weather is so cold and wet.

The chickens already hatched appear strong and healthy, and there is every prospect of a successful season.

Eggs required for hatching purposes are kept in a room of even temperature and away from strong light. When it is desired to hold them for more than a week before placing in the incubator they are placed in shallow boxes on chaff and turned once a day.

The hens in the breeding pens are not forced for egg production, but are fed a good plain mash in the morning, chaffed green stuff at midday, and at night a mixture of good grain, Algerian oats, wheat, and crushed maize.

A keen eye is kept on the male bird to see that he does not lose condition and that he is bright and active at all times.

With the approach of warmer weather it is necessary to keep a close watch on the birds for vermin. A good dust bath is very much appreciated by the birds and helps them to get rid of vermin. Perches and nests should be frequently examined for mites; if any are found, the perches, &c., should be either sprayed with kerosene or sprayed with a good disinfectant.

Although the weather has been very cold and wet since May, the pullets in the single test pens have laid well.

For the winter test, from April 1st to July 31st (122 days), the leading Black Orpington pullet laid 102 eggs, and the six leading Orpington pullets have laid 598 eggs, or an average for the 122 days of 99⅔ eggs per bird. The leading White Leghorn pullet has laid 94 eggs and the six leading White Leghorn pullets 534 eggs, or an average of 89 eggs for the 122 days.

A NEGLECTED MARKET FOR OUR WINES.*

By F. de Castella, Government Viticulturist.

The object of the present paper is to point out how little has been done in the direction of supplying the Australian public with cheap, sound, light wines for every-day use—something after the style of the *vin ordinaire* of France and of the great Latin wine-growing countries, to point out the vast potentialities which lie in this direction; and to submit a few suggestions as to how this neglected branch of our wine industry can, even at this late stage, be developed and placed on a firm footing.

Just over two years ago, when the Wine Congress was held in Adelaide, this phase of the question was referred to by the *South Australian Register*, in its issue of 19th May, 1921, in the following terms: —

> "The advice that Australians should drink more wine and less tea is all very well in its way, but—quite apart from the relative nutritive values—the question of cost operates against a general substitution of the one beverage for the other. Wine of the existing character and at the existing prices must necessarily remain a luxury rather than a necessity in the average middle-class Australian household, and, if vignerons wish to see it approximate more nearly to a national beverage here as it is in France, they should consider the problem of providing a lighter and cheaper article—without, of course, seriously impairing the quality which has made Australian wines famous abroad."

We have here the crux of the whole question. Wine is not a popular beverage with us for the simple reason that it is too dear. Even a well-to-do householder cannot afford to place wine on the table, as an every-day beverage, at the cost of three or four shillings per bottle, any more than the French householder could supply his family with expensive clarets or burgundies every day of the year.

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* Paper read at the Fourth Australian Wine Congress, Sydney, June, 1923.

I do not mean to say that the prices our vine-growers receive for their wines are too high—far from it. Under present circumstances it is difficult to see how wines of the type and quality we now bottle could be profitably sold any cheaper. Value for value, they compare most favorably with the wines of any other country in the world. What I want to point out is that there is another type of wine, practically unknown in the Commonwealth yet, which can be made available at a far cheaper price, and that in the providing and popularizing of this type there are possibilities for the expansion of our wine industry to an extent undreamt of by the most sanguine well-wishers of the Australian vine.

In the evolution of our wine industry we have taken as models the choicer and more expensive wines of old European countries. In other words, we have disdained the lower rungs of the ladder; we have made a start rather more than half-way up. We have, it is true, achieved remarkable success in the quality of the wines we now produce, but we have failed to make Australia a wine-drinking country; we have failed to make our industry of truly national importance, as are the wine industries of France, Italy, and Spain, and likewise of such South American States as Argentina and Chile, where, as with us, climate and soil favour the vine, and yet it is these neglected bottom rungs which alone can enable viticulture to achieve truly national importance.

Retrospective.

James Busby foresaw, nearly 100 years ago, in 1825, the great future in store for Australian viticulture; his optimism concerning it was as marked as his pessimism in regard to other rural industries. Examining the circumstances of the colony of New South Wales, to which he was about to emigrate, and the relation in which it then stood to the Mother Country, he describes it as being "Destitute of, or producing in a very inconsiderable degree, any article of produce which might minister to the wants or comforts of Great Britain, and, consequently, incapable of maintaining with her that regular and natural intercourse between a colony and its parent State, which consists in the exchange of the raw produce of the one, for the manufactured commodities of the other." He explains that Australia, as it has since been called, was looked upon " rather as a necessary and expensive appendage to the judicial institutions of the country, than a colony to which she might look for an extension of her power, or an increase of her trade and resources." . . . " Agriculture has been said to be the natural and proper business of all new colonies." but, he pessimistically adds, " the situation of the colony of New South Wales has been unfavourable for the exportation of the surplus produce of those articles to the raising of which its agricultural industry has, hitherto, been confined." Cereals, and even wool-raising, offered, in his opinion, but little hope. Far different are his views on wine production. He explains how, " from a consideration of these circumstances, and under a strong impression of the importance to the colony of an increase of its exportable commodities," he spent some months in the best wine districts of France learning the cultivation of the vine and inquiring to what extent it might be profitably grown in New South Wales. The result was " a conviction on his mind that there was the strongest probability, not of its partial success, but of its supplying the great *desideratum* of a *staple article of export*, to which the colonists of New South Wales might be indebted for their future prosperity."

"This conviction was founded, in the first place, on a consideration of the profits derived from the cultivation of vineyards (in France); the value which this culture gives to lands favorable for it over those employed in any other species of agriculture, and its importance in the rural economy of countries where it is most generally and extensively established; in the second place, on the probability that the climate of New South Wales, and many of its soils, at present useless from their sterility, would be favorable for the culture of the vine; and, in the third place, on its being a culture for the products of which an extensive market might be found."

Numerous examples are given of the results achieved by viticulture in various parts of France. "It would be superfluous to prove," he continues, "that an extensive and profitable investment for capital and labour would increase the resources of the colony and, consequently, its intercourse with Great Britain; . . . . present a more extended and increasing market for her manufactures; and that the bond of union between the colony and the Mother Country would be strengthened," &c.

Sixty years after Busby wrote thus, was held, in London, the Colonial and Indian Exhibition—in 1886. My late father wrote, for that occasion, a little book, descriptive of some phases of Victorian viticulture, entitled *John Bull's Vineyard*, a title borrowed from Max O'Rell, and which, let us hope, is prophetic. It is, indeed, becoming so, and it is fitting to here recall the names of Burgoyne, Pownall, Smith, Gilby, and others, who have brought our trade with the Mother Country to its present dimensions.

May I be pardoned a couple of brief quotations from my father's little book? In the introduction he excuses the borrowed title—"We have to speak of matters new and of moderate interest, of unknown wines; and this to John Bull, who hates anything new, especially in the shape of liquors; our only chance is to appeal to his practical qualities. . . . . If we can only cause him to observe that he has properties which he has hitherto neglected—vineyards in Australia, most valuable vineyards, which may bring him money and health, two things he is very fond of—the day is ours."

Federation was then a distant dream, but my father already deplores (p. 170) the Customs barriers between the Australian colonies, as they were then called, which imposed duties of 5s. and 6s. per gallon on wine, benefiting nobody and hindering the industry and constituting "the greatest obstacle to improvement in Australian vintages. . . ."

"Take away the intercolonial duty, a field three times as large is opened to every one, and they can all compete for the favour of an extended public."

"Wines, like works of art, require to be compared with one another. It is only when the intercolonial duty on Australian wine shall have been removed—when the growth of the various colonies can be placed side by side to establish Australian reputations—that the industry may be expected to advance, in the colonies first; outside, perhaps, afterwards. We hear of a possible federation of the British Empire. No doubt it will come some day. The free introduction into John Bull's Dominions of John Bull's pure wines of low strength would be, we imagine, amongst all other commodities, that which would be the greatest boon to the greatest number, at the same time that it would cause the less comparative diminution in the receipts from Customs duties."

"High-class foreign wines, consumed by the 'upper ten,' will continue to be imported. It would be to those who drink at present little or no wine, and consequently pay no duty, that the free trade of British light wines would be a welcome change."

It is noteworthy that it was not long after the 1886 Colonial and Indian Exhibition that the London market commenced to absorb an important part of our wine production. Good progress has undoubtedly been made, but much remains to be done. For recent fluctuations the war and its aftermath are, of course, to blame. These are only temporary and will soon be remedied, but the pre-war expansion of our trade with the Mother Country was all too slow. John Bull has, as yet, only partially awakened to the existence of his Australian vineyard —he drinks only a quarter of a gallon (.27 to be accurate) of wine from all sources per annum. The coming Empire Exhibition should provide the opportunity to entirely awaken him, thus completing the task commenced nearly forty years ago, so that we may, in fact as well as in name, become truly John Bull's vineyard.

Nearly a century has passed since Busby outlined our viticultural destiny. Progress has certainly been made, and an important industry established, but we have advanced all too slowly—too timidly. We produce ten million gallons a year, of which the United Kingdom took, in 1920-21, rather over a million gallons.

And yet we consume only half-a-gallon per head of population. It is here that lies our biggest opportunity. Here is the market which is capable of almost indefinite expansion, if we only go about it the right way. This market must be expanded before we can look upon ourselves as a really viticultural country.

Importance of the Home Market.

The world produces, roughly, 3,000,000,000 gallons of wine annually. Of this total the Latin nations of Europe, France (including Algeria), Italy, and the Iberian Peninsula, contribute no less than 2,640,000,000, leaving only 360,000,000 gallons for the rest of the world. The Latin vintage represents six-sevenths of the world yield, and France, including her African colonies, contributes about half the Latin contingent, or about three-sevenths of the world's annual vintage.

France is thus easily the foremost viticultural nation, and her choice wines are household words the world over. She is the greatest wine-exporting nation. Yet, what is her export trade in proportion to her total wine production? For a good many years in the pre-war period it fluctuated in the neighbourhood of 4 or 5 per cent. Last year the export proportion was considerably less, owing to reduced shipments (only 26,000,000 gallons); and the enormous vintage of 1,760,000,000 gallons was gathered; export thus amounted to about 1½ per cent. of the total wine crop.

Similar figures might be quoted for Italy and Spain. In all these countries it is the home market that absorbs almost the totality of the wine grown annually; only a tithe is exported. So must it be in Australia before we can fulfil our viticultural destiny.

We must, however, make one important reservation—shipments to Great Britain should not be classed as exports. To supply the Mother

Country with the wines she cannot grow herself is surely not exportation any more than is the sending of Algerian wines to their mother France.

The sea carriage is much longer in our case; but Australia is as much to Britain as Algeria is to France. Britain has been able to go further afield—that is all—owing to the wider range of her "sail-stretched wings."

Vin Ordinaire.

An examination of what this enormous wine consumption of the Latin countries consists of is interesting. The preponderant part of it is *vin ordinaire*, a type which is almost an unknown quantity to the average Australian or Englishman who has not resided in France, Italy, or Spain, and who only knows the wines of these countries by the type exported—clarets, burgundies, champagnes, ports, sherries, &c.

In Latin Europe, wine is not a luxury, but one of the daily necessaries of life, figuring on the table as an integral part of the mid-day and evening meals of rich and poor, as well as in hotels and restaurants, where it is not charged for any more than bread or tea are in Australia.

In wealthy homes choice wines are served occasionally, but *vin ordinaire* is the family beverage which appears every day on the table.

In these countries wine is not consumed to any extent between meals, but a meal is not considered complete without a glass or two of wine. Taken regularly in this way, it is a food and not a stimulant—it forms part of the daily ration, replacing an isodynamic quantity of other carbohydrates. Though consumed very generally, it is always taken in strict moderation, and very often, especially in summer, it is diluted with water.

Space will permit only the briefest reference to the relation between light wine and temperance - the general sobriety of the people in Southern France and other wine-drinking countries is proverbial Alcoholism is unknown in the regions of abundant light wine. There is no temperance question in Southern France because there is no intemperance. Alcoholism has given cause for alarm in Northern France, where the large beet-root distilleries are situated, but not in the vine-growing districts—it is noteworthy that the slogan of reformers is *Le vin contre l'alcool* (wine *versus* alcohol).

For it to be possible for wine to occupy such a position in the daily life of a nation, two things are necessary—the wine must be of low alcoholic strength, and it must be available at a price which will place it within the reach of all. Both requirements are met in *vin ordinaire*.

Official figures concerning the strengths of French wines are instructive. Those for 1907 vintage may be quoted—there has been little change since. In that year the total production of France was 1,453,564,000 gallons (Algeria excepted), classified as follows:—

	Gallons.
Wine of less than 19½% proof (11°)	1,296,372 000
Wine of 19½% proof	116,999,000
Wine of more than 19½% proof	40,000,000

In that year the quantity of sweet wine made in France amounted to only 712,000 gallons!

In pre-war times the usual average value of the wine vintaged in France was in the neighbourhood of 20 francs per hectolitre, or nearly 9d. per gallon, at which figure viticulture paid well.

In years of over-production, this price was sometimes reduced by more than 50 per cent. Prices such as these are rendered possible by two factors, viz., heavy yields and rapid maturation.

The *Midi*—Hérault and the three adjoining departments—has long specialized in the production of this class of wine. Deep, fertile soils are planted with heavy-bearing sorts, such as Aramon, Carignane, the Bouschet, hybrids, &c., and manuring is practised to an extent unknown in the less-productive vineyards yielding choicer wines. Intense culture is the watchword, and yields of 1,000 gallons per acre are quite common.

Aramon, which is one of the heaviest-bearing vines known, yields, in some favoured spots, more than 3,000 gallons per acre. A peculiarity of the wine made from such grapes is that it is fit for consumption when a few months old. Lengthy maturation of necessity increases the price of a wine; dispensing with it permits it to be sold cheaply. Unlike choicer wines—clarets, for example—which need wood and bottle age to acquire the quality they are capable of developing, *vin ordinaire*, which constitutes the bulk of the wine of France, is almost immediately fit for consumption, and improves little, if at all, on keeping—it is usually at its best at twelve months old.

Wines of this type, both red and white, naturally possess but little bouquet, but they have a briskness and freshness which renders them attractive to the regular consumer. They are thirst-quenching in a high degree, especially when diluted with water, and are, as a general rule, faultlessly made and in excellent condition.

Their high acidity at first seems strange to an Australian, but it is the natural acid of the grape—not that of faulty fermentation. This very acidity is a quality looked for by regular wine-drinkers, who find our less acid wines somewhat flat; it permits the addition of water without making the wine insipid.

I am aware that many will not share my views as to the feasibility of developing a big demand for such wine in Australia. I can almost hear the objection, "That is all right for a Latin people, trained from childhood to regard wine as a necessary of life. We are a different race—Anglo-Saxons will never learn to drink wine," &c.

I must disagree. Our climate is eminently suited for the change. Light, natural wine is the ideal beverage for this climate, just as it has proved itself to be for the Latin countries fringing on the Mediterranean. As Dr. Springthorpe told the Basic Wage Commission some three years ago, "The Australian is a Britisher living in a Mediterranean climate. . . . He is developing Latin characteristics, and will gradually go in a Latin direction of food and beverages. . . ."

If he has not made more progress, who is most to blame? Is it not the producers of the beverage? We have certainly done little to help him to become a wine-drinker—to effect this desirable change which would completely revolutionize our wine industry—because we have failed to place within his reach, at a reasonable price, the only type of wine which has rendered possible the universal adoption of this beverage by Latin Europe.

In order that we may develop a demand for wine of this type, two things are necessary—

(*a*) To provide the right kind of wine.
(*b*) To sell it at the right price and in the right way.

Can such Wines be Grown in Australia?

Undoubtedly they can Even in the warmest parts of Victoria, wines can be grown of as low an alcohol strength as may be desired. The experimental wines, made each season for a good many years past, at the Rutherglen Viticultural Station are sufficient proof; and yet the wines generally produced in the Rutherglen district are as full-bodied as those grown anywhere else in the Commonwealth.

In order to produce wines of this type it is, in the first place, necessary to plant suitable varieties on the right class of soil. Heavy bearers are, of course, essential. Aramon and the Bouschet hybrids are well adapted for the purpose, but several others may be added to the list. The inclusion of a small proportion of one or more choice sorts, to increase bouquet or colour, might be made without unduly increasing cost of production or unduly retarding maturation. The vineyard should be planted on fairly rich, level land, rather than on the hillsides so suitable for fuller-bodied wines. The aid of irrigation can be usefully called in, as in Argentina. Vintaging would need to be at perfect maturity and before the grapes have become at all over-ripe.

Careful cellar manipulations are, of course, essential, not only during wine-making, but more particularly in subsequent handling. Our cellarmen, so long used to robuster wines, may at first find irksome the frequent filling up, necessary to adequately protect wines more susceptible to ullage. Their proper management, however, presents no serious difficulty; what can be achieved in French cellars can equally well be done here, and our wineries are quite as well equipped as those of France.

Preliminary Maceration.

I wish here to draw attention to the merits of the wine-making method known by this name, which was recently evolved in Algeria. It is peculiarly adapted to the making of wines destined for early consumption, owing to the greater delicacy and refinement they show, and their freedom from coarseness and excessive roughness, sometimes found even in our good dry wines when young. They retain a good deal of freshness and taste of fruit—*fruité*, as it is termed in French, which must not be confounded with fruitiness or sweetness.

Briefly, the new method consists in crushing and stemming in the usual way, and immediately sulphiting with four times the usual dose of SO_2; the commencement of fermentation is thus postponed for four days, during which time the juice macerates on the skins, extracting from them a sufficiency of tannin and colour. The juice is then pressed off and fermented apart from the skins, as for white wine. Maceration thus takes place *before* and not *during* fermentation, as is usual for red wine. Fermentation is slow at first, hence high temperatures are avoided; it is thorough and complete, and the colour is nearly as deep as with grapes treated in the usual way.

I have the honour to submit, for the information of the Congress, a sample of light red table wine, made by this method at the Rutherglen Viticultural Station during the 1922 vintage . The quantity made was 150 gallons; the grapes were mainly Aramon and the Bouschet hybrids (Alicante Bouschet and Calmette), with a little Corbeau and Mondeuse added, for colour and bouquet. The average gravity was 11° Baumé. Bisulphite of potash was added at the rate of 13 ounces per 100 gallons.

In submitting this result of our first experiment, I do not claim, of course, that finality has been reached. The wine has rather more colour and body than *vin ordinaire* needs. Modifications might be made in several directions. I wish this sample to be only looked upon as an illustration of what can be done by the new method.

Different Methods Applicable.

The right kind of wine can, no doubt, be made in different ways. Whether preliminary maceration, the usual Southern French method, or something intermediate should prove the best, time will tell. The result aimed at is of more importance than the means by which it will be attained.

Similarly as regards type—we cannot forecast exactly what will ultimately find most favour—it will probably be rather less acid than the French type. In Spain the wine is usually less acid than in France, though there is not much difference in strength. We have already proved the London market, and know what it requires of us. It is strange that we should be less fixed as to what we want ourselves. Owing to the warmer Australian climate, it will, no doubt, be something lighter—an eleven, or perhaps even a ten, Baumé wine.

Whatever the exact type, and whatever the best way of making it, there is not the slightest doubt as to our ability to produce it, even in our warmest districts, and in such quantity per acre that it may be profiably sold at a cheap price, such as would permit it to be a household beverage, just as in Latin Europe.

Bulk Handling.

It is not enough to grow the wine so that it can be sold wholesale at a low price. The retail customer must also benefit. This implies bulk handling. Eliminate the bottling charges, and an enormous reduction in price is at once realized. Without bulk handling, wine could not be made available, even in the Latin countries, at the cheap rate which alone enables it to be an every-day beverage. In France no householder buys his *vin ordinaire* in bottle. He obtains from his wine merchant or grocer, in small cask or jar, a quantity sufficient to last some weeks or months; the bottling of this supply is either one of the ordinary domestic duties, or, if the cask be of fair size, a cooper is called in, who does the bottling at a moderate charge.

Customers are so numerous that the retailer sells a sufficient quantity to avoid having receptacles "on ullage" for more than a few hours; deterioration from this cause does not, therefore, occur. It is this need to avoid exposure of light wines to air, that makes our retailers so reluctant to handle them; they prefer to stock sweet wines, which support contact with air with impunity. Customers for light wine are so few that the vendor has to keep a hogshead on tap for a week or more, with the result that about half the contents of the cask is delivered in such bad order as to deter customers from seeking further supplies.

Retailing under CO_2 Pressure.

These difficulties can be quite easily overcome; all that is necessary is handle the wine, whilst on draught, under slight carbonic acid pressure in much the same way that beer is now served in many bars, but with this difference, that a much lower pressure is needed. Reducing valves are now obtainable, capable of delivering gas at a pressure as low as 2 or 3 lbs. per square inch—just enough for it to immediately fill the space vacated by the withdrawal of some wine, to the complete exclusion of air. A hogshead or puncheon, thus equipped with CO_2 cylinder and reducing valve, could remain on tap, and ullaged, for several weeks, if necessary, and the last lot of wine withdrawn would be in as good order as the first.

A simple device of this kind would make the sale of light wine as popular with retailers as is now that of the sweet wines, which form so large a proportion of the present retail trade. The customer, receiving his wine in perfect condition, instead of flat, cloudy, and even more or less pricked, as he sometimes does now, a demand for light dry wine would be created such as is not now generally realized.

Retailing of Wine—A Few Suggestions.

I approach this part of the subject with diffidence—my duties have more to do with technical than commercial aspects—and yet as one who has the best interests of the industry sincerely at heart, I feel compelled to refer to one of the main reasons why there is not a far greater consumption of the high-class wines we now bottle. These wines certainly belong to a more expensive class than *vin ordinaire*, which they cannot, therefore, replace as a family beverage. Their consumption would, nevertheless, be very much larger than it is to-day were it not for the differential treatment met with by wine and beer in the majority of Australian restaurants and hotels.

How is it that the retailer is content with a profit of 15 or 20 per cent. when he sells beer, but considers himself entitled to over 100 per cent. when he sells wine? The man who drinks wine is fair game. "He's a toff and can afford to pay " seems to be the attitude of the majority of eating-houses. Light wine is an ideal beverage to be consumed with meals—not between them. The restaurant should be our main outlet—not the wine shop. And yet, in most restaurants, the price charged prohibits the every-day consumption of our wine to all but the wealthy or the prodigal. It is strange that the wine-grower has so long tolerated being thus penalized. Until he insists on similar treatment to that which the brewer gets, there can be no marked increase in wine consumption

Two innovations could, in my opinion, be introduced for the great good of our wine industry. The first is a new form of licence—a restaurant licence, such as would permit the sale, *exclusively* with meals, of wines of light type. This licence would not be in substitution for, but in addition to, existing licences.

The second is a new sort of bottle. The ordinary or " reputed " pint bottle is an unsatisfactory size. As the exquisite said of the egg, "It's too big for one, and too little for two." The "baby" bottle, on the other hand, is too small for one. A bottle of imperial half-pint size should just meet the case, and, if sold at a reasonable price, do much to popularize the drinking of wine with meals.

Our wine industry has reached important proportions, of which we are justly proud—and yet what is it compared with those of the leading wine nations? Of France, for instance, where 1,760,000,000 gallons were vintaged last year, and where, among rural industries, the vine ranks second only to wheat. The Australian drinks three bottles of wine a year; the Frenchman a quarter-cask. A large increase in our wine consumption would benefit our country, our people, and, of course, our vine industry. It seems to the writer that the best way to foster such an increase would be to make available, at a cheap price, wine, perhaps not indentical, but of somewhat similar type, to that which is so enormously popular in France.

TOBACCO-GROWING IN UNITED STATES.

The following Progress Report has been received by the Department of Agriculture from Mr. Temple Smith, who left Victoria three months ago commissioned by the Government to inquire into and report upon the most successful and modern methods of tobacco culture in the United States, and to arrange for the migration here of tobacco-growing settlers:—

I have to report that I am at present in Chatham, Virginia, one of the most celebrated districts for the production of high-class bright tobacco leaf, known as the Piedmont Section of the Old Belt. The Department of Agriculture of the United States has an Experimental Tobacco Farm of 50 acres here, and I have been in frequent communication with the manager, Mr. T. Copley, who has given me much assistance and information.

This State in 1921 had under tobacco 167,000 acres which produced tobacco to the amount of 91,550,000 lbs. of leaf, ranging from the highest class cigarette to the bright smoking tobacco. The soils used for tobacco culture are grey to light-red in colour, built up from sandstone formation chiefly, with some granite and shale. They are poor in quality, and require heavy fertilizer dressings to enable them to produce any crop, and up-to-date tobacco-farmers grow only one crop of tobacco in three years, following a rotation system of first year tobacco, second year wheat or rye, third year red top or herd's grass, or peas, and tobacco again. Even new land is heavily fertilized, and Victorian growers on poorer soils have much to learn in this respect.

The altitude of Chatham is 500 feet, and the land is undulating to hilly and liable to erosion with heavy rains. Soils in Victoria which may be compared with these in Virginia are to be found in considerable areas on the King River Valley around Whitfield, and on the Ovens, Mitta, Kiewa, and Upper Murray Valleys, though the lands now devoted to tobacco in these parts of Victoria are richer naturally than those used in Virginia, and, consequently, produce heavier and coarser leaf. There is much land along the foothills of the valleys mentioned, however, that will in the future produce tobacco more of the Virginian type.

The rainfall here is considerably heavier than is the case in the tobacco areas in Victoria. An annual fall of 50 to 60 inches is usual here, and an average of 3 to 5 inches falls during the growing season, monthly, though good crops have been grown on much less than this, and the wetter seasons make trouble in causing erosion, disease, and weed-growth. With good cultivation Victorians should find in average seasons the rainfall sufficient where tobacco is now grown.

Land in this particular district costs £30 per acre, cleared but without buildings. Similar land can be purchased in Victoria for from £4 to £8 per acre. Virginian growers apply from 1,000 to 1,400 lbs. of fertilizer per acre for tobacco, and would not consider an attempt to produce a crop without such help. This is where Victorian growers on the lighter soils have much to learn, as not only is the yield increased, but the quality greatly improved and the growing season shortened. The fertilizers used consist of dried blood or nitrate of soda, superphosphate, and sulphate of potash, for preference at the rate of 375 lbs.

of dried blood, 700 lbs. of superphosphate, and 100 lbs. of sulphate of potash. On the richer land down to half these quantities are applied.

The land is cultivated four to six months before the transplanting season, and kept as clean as possible. Just before transplanting a light furrow is drawn every 3 feet and the mixed fertilizer distributed along the bottom. Another furrow from each side is then turned over on to this, and on the hill so made the plants are put in, and the soil between the rows worked down and finally worked back towards the plants, until they are hilled up much as a potato crop is hilled in Australia. It is doubtful, however, whether this practice in cultivation would suit our conditions, which are drier, and probably one reason for the system adopted in Virginia is to provide easy drainage after heavy rains.

Seed beds are made in new land each year, and a patch in the forest is cleared and burned, preferably with a south-eastern aspect and shelter from the cold northern winds. A dressing of 200 lbs. of complete fertilizer is used on each 150 square yards of bed, and the whole is covered with cheese cloth until about ten days before the plants are drawn for transplanting.

American growers allow the plants to become more advanced in growth than do Australians, and claim that a plant 6 to 8 inches in length is stronger and grows better than smaller ones. They are put deep in the ground when transplanted, the rule being to put them down to the heart, or bud, and in ordinary seasons they are neither watered or covered, though this season being exceptionally dry, watering is being done in some cases. The crop in this district is always planted if possible between the middle of May and middle of June, and takes from 90 to 100 days to mature. The crop is topped as soon as the requisite number of leaves can be obtained, and ten to twelve leaves are considered sufficient on these soils.

When harvesting some growers prime the leaves as they ripen, others cut the whole plant, and some prime the first leaves to ripen, and cut the plant with the balance.

All tobacco here is flue-cured in log barns, which are primitive but very satisfactory, and of this process I will report fully later.

The average yield of tobacco per acre in this section is 550 lbs., and the average price 1s. 3d. On these figures the American grower does not reap as great a profit per acre as the Australian, especially when the cost of fertilizing is taken into account. Growers with whom I have talked estimate the whole cost of production at from 7d. to 10d. per lb.

There are many pests in America that Australia is free from, but in this district the Australian arch-enemy, Blue Mould, is not known. I have already heard of a variety which is said to be disease-resistant to a greater degree than others, and which is peculiarly adapted to dry and hard conditions, yet produces a fine type of tobacco, named Lizard Tail, some seed of which I am securing.

One advantage the United States grower has is in the choice of machinery, and the cost of same. A double-row cultivator of better make than any I have seen, costs only £12, a waggon about half the Australian cost, and other machinery in proportion.

Up to the present I have had only a short experience with tobacco-growers in this country, and intend to go into other phases of the industry in future reports. I feel sure that there is much to be learned of value to Australians, and I have received the greatest kindness and hospitality from each and every one with whom I have come in contact.

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WEEDS AND THEIR ERADICATION.

(Continued from page 441.)

By H. W. Davey, F.E.S., Orchard Supervison Branch, Department of Agriculture.

Common Furze, *Ulex Europæus*, L. Family; *Leguminosæ.*

This exceedingly common plant is well known under the several names of furze, gorse, or whin. It is probably an importation from England, where it is very plentiful on the poorer classes of soil, and when covered with its masses of golden blossoms often becomes quite a feature of the landscape (Figure 68).

Furze is a much-branched, spreading shrub. It is evergreen and perennial with hard spiny leaves excepting when the plant is in the seedling stage. When well grown its coarse woody spiny branches make an almost impenetrable mass of vegetation, except to rabbits and other vermin, which find seclusion under its thorny branches and sanctuary from most of their enemies.

The seed vessels burst with a crackling noise during hot weather, the pods drying in such a way as to produce a strong tension which causes them to split apart violently, thus causing the seeds to scatter themselves at some considerable distance from the parent bush.

Furze when neglected soon becomes a most troublesome weed owing to its deeply-growing root system, perennial nature and general robustness, while its seed-throwing habit also assists in its rapid spread over considerable areas of land.

Probably the best method of eradication is first to burn off the bushes and afterwards dig out the stumps and roots. Cultivation will easily control furze, but as it is essentially a pest of waste lands or of grazing areas, most of the ground on which it is growing is unfit for the plough; therefore its eradication by this means need not be considered here.

After the furze has been burnt off and its roots grubbed out, numerous seedlings will arise from dormant seeds that have been previously scattered. These seedlings when numerous can easily be dealt with by sprayinig them lightly with an arsenical weed-killer, or the more expensive method of hoeing them out can be adopted.

If the fertility of the soil be improved by the addition of manure, and a better class of herbage thus encouraged, grazing stock will eat out the immature and tender seedlings.

Furze and the blackberry, fortunately, are both proclaimed for the whole of Victoria under the provisions of the Vermin and Noxious Weeds Act. Fortunately, because both have spread very rapidly of late years over large areas of privately-owned and Crown lands, and each of the species affords such ideal cover for imported

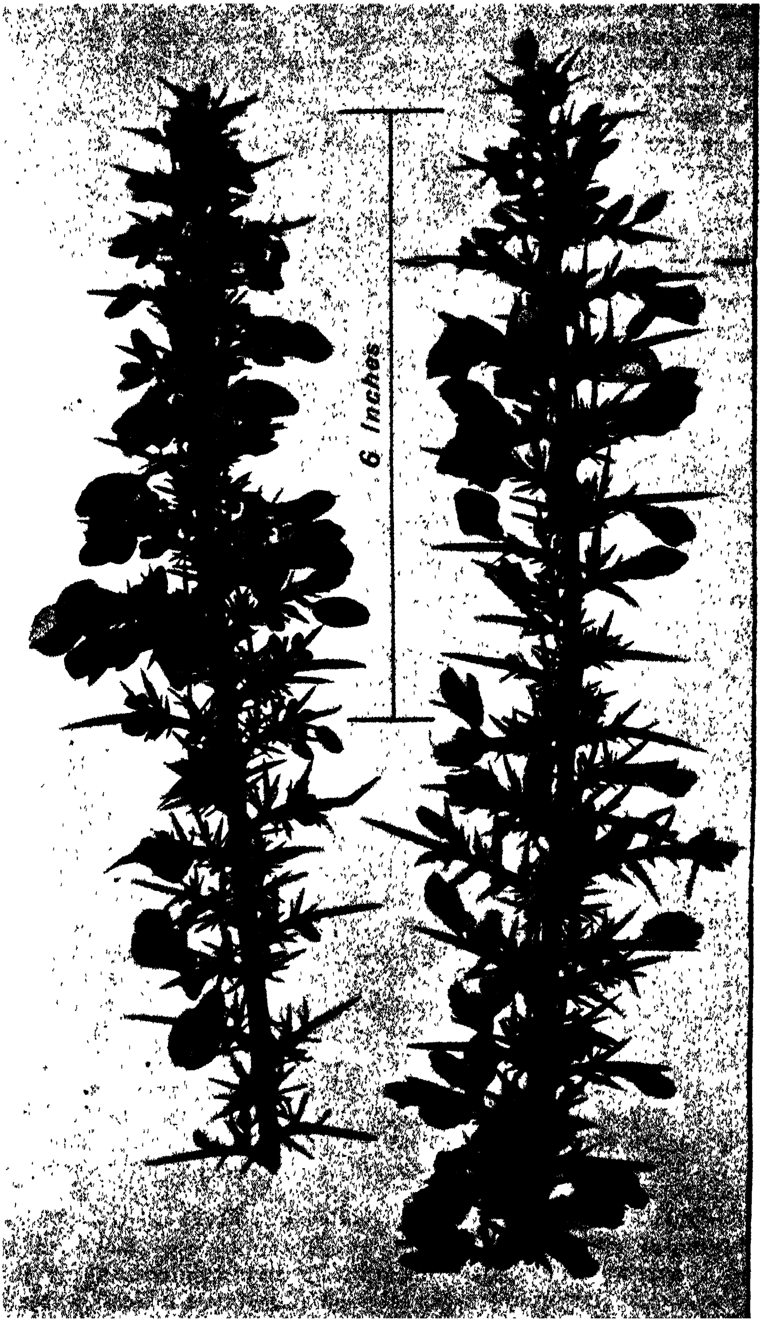

Fig. 68.—Common Furze, *Ulex Europæus*, L.

vermin, which take naturally to the shelter, that these two plants and vermin always seem to be associated. Probably both the rabbit and fox in Europe have availed themselves of the hospitable shelter given them by these plants over a great period of time, so that now they instinctively resort to this dense cover.

In fact, in the case of the blackberry, there might almost be said to be a symbiotic relationship between it and the fox, as while the blackberry provides the fox with safe and warm shelter, he, by feeding on the ripe berries, distributes the seeds over wide areas, and thus becomes a leading factor in the dispersal of this species,

In view of the suggested introduction of certain pest insects from America to Australia for the purpose of destroying prickly pear, it is worth mentioning that furze affords another excellent example of an insect changing from its natural food plant to another of a widely different species, and incidentally points out the great danger of introduced pest insects doing likewise and changing their host plant.

A cerambycid beetle belonging to that fine genus *Uracanthus* feeds naturally on the indigenous native hop, *Daviesia latifolia.* (See the *Victorian Naturalist*, volume XXIV., page 155.) This beetle *U. bivitta,* has developed a strong liking for the wood of the introduced furze, the stems of which it frequently tunnels in the manner characteristic of the species. In New South Wales another species of the same genus, *U, cryptophagus,* is reported to have turned from its native shrub to the cultivated orange tree, which is now often seriously damaged by its larva.

In this instance we have a native species of insect attacking an introduced plant, affording yet another illustration of an insect enlarging the range of plants that are suitable for the food of its larvæ.

Beetles of the former species reared from the stems of furze are in no way inferior in size or colouration to those reared from their native plant food, which proves conclusively that the change of food agrees with them. Of course the clearing of land for settlement will have the tendency to force many insects to acquire new tastes in food, but in many cases the diet is changed and a new taste acquired long before any shortage of their original food becomes acute.

The important fact that stands out, however, is that no one can say what plant will be immune from attack either by native or introduced insects, and it is here where the great danger lies in introducing pest insects into Australia, the danger of which becomes much greater when it is remembered that care is always taken to introduce such insects without their natural controls.

In view of the great importance now being attached to the cultivation of cotton in Australia, and the reported introduction of pest insects to assist in the eradication of prickly pear, this phase of the question must, or at any rate should, be considered very seriously at the present time.

The cotton plant appears to be one that is likely to be sought after by insects of different orders, and in addition to the likelihood of its being attacked by our native insects that may acquire a liking for it, there is the further danger that later on introduced insects, whose only qualification is their known destructiveness to vegetable life, may develop a taste for it.

(To be continued.)

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THE STANDARD HERD TEST—1922-23.

Conducted by the Department of Agriculture.

ELEVENTH ANNUAL REPORT.

By J. M. Kerr, Herd Registrar.

Culling as Necessary as Testing.

If this test has proved one thing more than another, it is the disparity that exists in the producing capacities of cows enjoying otherwise equally favorable conditions. Equal feeding and equal handling do not atone in the inferior animal for her lack of inherent capacity to produce. Another fact the test shows, over and above what it was designed to demonstrate, is the necessity of its natural adjunct—culling—if the full benefit possible to owners from testing is ever to materialize to them. By culling is not meant merely reducing the herd, though this alone might improve the yields of many of the hungry ones. What is meant is rational culling, unhampered by superstition and convention fad—a system which works always towards the one goal of higher production per cow. This is what helps the owner; this is what repays the State.

Use or Beauty—Which First ?

A fine disdain of inferior producers, irrespective of their looks, has characterized every winner of the herd prize since its inception, and this year's winner is no exception to this rule. There is a place for the beautiful, of course, but utility must be allowed precedence over it in such a commercial concern as a dairy herd. There is but little more argument for beauty in a cow that there is for it in any ordinary manufacturing machine. It is welcome as long as it is attached to

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efficiency, but it is no substitute for efficiency. If a struggling dairyman, with interest to meet and storekeeper to pay, must mix his aesthetic taste up with his means of livelihood, he had far better feed his cows, and thus escape the most common ugliness of the general dairy farm—emaciated animals.

There is not much difference between the man who insists on the useful being beautiful and he who would ever make the essentially beautiful useful. The function of the dairy cow is utilitarian. If beauty can be retained in the herd without cost, well and good; but the ordinary commercial dairyman, and especially the beginner, working with grade cows, would be well advised to leave the pursuit of such a non-essential to those whom it pays.

This advice is meant especially for the struggling and not too-financial young dairymen who are endeavouring all over Victoria to make a decent living from inferior cows—cows that are perhaps much prettier in looks, if they were only well fed, than many of the best cows in this herd test, but which do not enclose in their prettier skins the same invisible little nervous arrangement which turns fodder into milk instead of meat.

Once a man is on his financial feet it is a different matter. He cannot be expected then to place the same importance on the essentially useful, although from a State point of view it would be better if every farmer as he becomes independent would use his available capital to increase the earning capacity of the farm till the maximum is reached Some do this; some build a comfortable, and, may be, a flash home, some buy a motor-car, or racehorses, or polo ponies; some make a grand tour; some keep a deer park, and some keep a dear paddock by limiting it to the grazing of only beautiful cows which have never been vulgarized by a tester.

It is, however, believed that what dairy farmers in this State would most welcome, and what the many worthy among them most need at present, is a means of getting at least the same returns with fewer hours of labour, and this is just what sane culling—*i.e.*, based on testing—means. This practice is on the most certain and direct route to butter-fat, which, sordid and all as the word may sound, is the fairy wand capable of banishing all the dairy farmer's material troubles and most of the State's, too, if the majority of the people could only be persuaded to think so.

This may not be the advice the dairyman is accustomed to receive on this vital question of his financial welfare from breed fanciers, the members of which class, as distinct from the tested-cow breeders, are too often regarded as counsellors of the industry? Instead of being directed straight to butter-fat, so real that it can be touched and handled, he is, in its absence, too often advised to accept something in the cow's outline which he is told is the same thing. The fanciers of the past succeeded in getting their really beautiful ideal accepted in show competitions as the orthodox form of a dairy cow—whether because of its delight to the eye or because they believed it did really indicate butter-fat, it is hard to say. There must, of course, be some standard for a show prize, and as that set is astray no more often than any other, it serves; but dairymen should learn that it is in no way essential to production, and any extra price paid because of it will not necessarily be returned in the milk pail. Even now, when the Babcock tester has discredited body symmetry or type as the guide to butter-fat—there are still those who would re-erect the fallen idol. To vary the well-known stanza—

> So many points, so many breeds,
> So many claims of this and that,
> When just the yield of milk and fat
> Is all the business needs.

That is just it. What a dairyman needs, and what he desires, are not always the same. And it has usually been possible to flatter him that his preference for the most typey animal is right, and that a good judge needs nothing more than his eye. And the eye has it once again over the Babcock tester; but the purchaser more often than not rues the day he allowed a bit of fancy type to lure him from the much more needed butter-fat just because the latter happened to be in a plainer body.

By the way that some men become obsessed by breed type one would imagine that butter-fat from the fashionably shaped cow would bring at least sixpence more a pound than that from her plainer sister. It would need to often, but, alas, it never does. Quantity always swells the cream cheque, but the looks of the cow it came from never do. This is not decrying beauty in its place, and it is certainly not claiming that gracefulness of conformation inhibits production.

A dairy cow's uselessness is never because of her beauty; but there are many cows that are useless in spite of it. Beauty itself is invariably as harmless as it is pleasing; it is only the intensity of love for it which is dangerous. And so it is with beauty of type in our dairy animals. Who, that has dealt with a herd of milking cows, has not been tempted to favour the pretty ones? The man who should find it easiest to succeed at dairy farming is he who possesses a natural liking for the animals. Here this very qualification may really tend to his undoing. We invariably find a herd-master, who is not to be guided by the scales and tester, pinning his faith to certain animals because of their superior appearance. Until disillusioned by the test, it is quite easy to persuade oneself that type and production go hand in hand.

Time was when one had only to have a reputation for breeding beautiful dairy-type, to feel smugly conscious of the highest honour in the profession. Those days are about gone, and regret it as we may, commercial dairying practice now demands that beauty of type only, even though it include good teats and udder, be no longer accepted as signifying the most suitable animal for the dairy farmer's purpose.

Commercialism is working into all our sport, and now it is getting into dairy farming. To abandon beauty as an essential attribute of a dairy cow may seem getting away from the ideal, but really, considering the penalty which slovenliness of method is exacting from the industry to-day, the only way to make dairying more idealistic is to make it more profitable. Practical idealism which gives hard workers a well-earned measure of ease is preferable to that which requires all one's ready cash to sustain it. We can return to the latter ideal when trade ceases to be competitive. Until that happy time, no dairy farmer who needs profits from his occupation can afford to allow his predilection for

The Winning Herd.

Owner—Mr. T. Harvey, "Jerseyholm," Boisdale.

7 Mature Cows averaged 467 lbs butter fat
1 Second-calf Cow gave 524¼ lbs butter fat
3 Heifers averaged 354 lbs butter fat.

type to divert him for a moment from butter-fat—the commercial essential of a purely commercial calling.

It may be a real disappointment, no doubt, to a young dairyman, progressive enough to adopt testing, to find that the most ornamental animals are so often the ones which it pays least to keep. He will, doubtless, be told that he cannot afford to part with type, because, if he gets away from type, production will suffer; this will naturally make him think that the two should go hand in hand. Then he will be advised, probably by the same people, not to breed for production only, because by doing so he will inevitably lose type, and he will assume that the two qualities avoid one another, and that to achieve heavy production he must become resigned to plain animals.

He will probably have difficulty in reconciling these claims, which, if they have any meaning at all, are that if we breed for production alone, the very act loses it for us, unless we tack on type; which any one possessed of but an elementary knowledge of the rules of breeding must regard as an obvious absurdity, amounting to excessive glorification of a relatively useless characteristic—appearance.

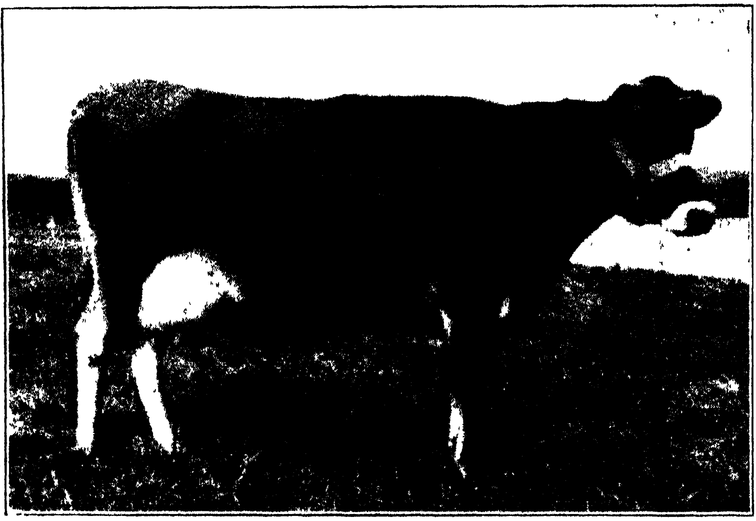
The fact of the matter is that an animal suitable because of type and one suitable because of utility, require but one characteristic in common—a decent udder—which characteristic may also exist in an animal deficient in both form and producing function.

There is no disputing the fact that the two are quite independent characteristics which may occur co-incidentally or apart. Except that, to be a satisfactory producer, a cow must have conveniently-shaped teats and udder, we need not in breeding for production necessarily worry about type at all, so long as the parents are of high-producing strain, by fact and not by mere opinion. If a breeder gets away from production, it is because the male and female germ-cells, which united in the animal's begetting, were not possessed of the principle. Plainess had no more to do with it than prettiness. Likewise, if we lose type (not an awful catastrophe, surely, provided we retain production) it is because the cells of the quality were not sufficiently represented in the mating. The best way to insure either is to select the one which is wanted most, and dairy farmers themselves have to choose which is the more pressing.

This might prompt the question, "Why should both not be bred for in the one animal?" There is no reason whatever, except that few can honestly afford it. A breeder should understand the task he is setting himself in doubling the major objectives. There are far more pure-breds plain than otherwise, but which, nevertheless, have enough breed type to enable us to distinguish the breed. Getting this inferior type is the easiest thing in the breeding world. Even getting it along with the capacity to produce well is also comparatively easy, provided production is always safeguarded in the selecting of both sire and dam.

Production, being a necessity always, cannot profitably be omitted, however difficult its attainment might be. In endeavouring to reproduce perfection of type along with it, we are aiming at an additional attribute, which is not a unit characteristic in itself, but is a composite thing made up of perhaps twenty or more unit characteristics, all independent of one another. Even one of these failing to recur upsets the whole project. The result is as might be expected, one perfect animal in thousands, and this one not possessing all its parts in equally pure degree. In including one, another escapes, much like the old game of "Pigs in clover," and of little more public utility. It thus might well require the breeding of hundreds of animals to make one show-ring champion. What sort of chase is this towards which to urge ordinary dairy farmers, the justification for whose industry is only the amount of utilitarian dairy produce they can succeed in winning for the nation? If the same valuable product could be produced more cheaply without a cow at all, we would, from a national point of view, suffer no economic loss whatever.

It will be found before long that the only cows that have moved away from production are those whose breeder gets away from the tester. If culling, therefore, is to result in maximum butter-fat returns it must be conducted on this principle, that beauty of conformation has nothing to do with the animal's fat production, and one has to decide for one's self how far it is advisable to forgo butter-fat or (the same thing) money, for the less useful pleasure of having one's herd-animals admired as a picture in the show ring or by visitors to one's farm.



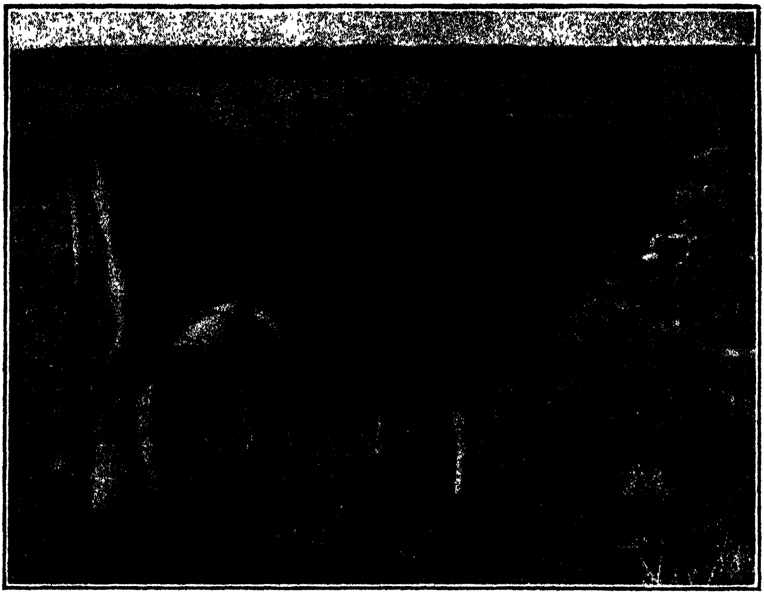
Mr. T. Mesley's "Ragtime of Warenda."

(Born 30.8.18.)

Season	Milk. lbs.	Test.	Butter Fat. lbs.
1920-21	6.365	6.71	427.24
1921-22	6.811	7.08	482.14
1922-23	9.186	6.70	615.51

Where butter-fat is the first consideration, the cow herself, as the mere instrument, must be made subjective to the product. Some will contend that this practice would result in their not getting sale for their stock. Type in the present state of dairying education certainly does enable a man to sell otherwise inferior animals; it will command a price for a "dud" producer that could never be procured if she were plain. And that is why animals recommended on their appearance should be regarded with more suspicion than are those whose owner is desirous of having their record known. Even plain bulls will command a price if their deficency of type is compensated for by good production-records behind them.

But who is anxious to sell high-producing females? If a breeder breeds this sort, handsome or plain, he will, provided he is a tester, need to keep their price very high, or he will find them sold in spite of his reluctance. There was never yet a breeder who had any difficulty in selling a genuine producer. If dairymen would only take up the business of breeding and culling their own herds on the lines indicated, we would see progress instead of stagnation.



Mr. W. H. Axford's "Patricia of Warenda."

(Born 23.6.20.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs
1922-23	7,865	6.18	486.30

In view of what many progressive herd-owners have been proved by this test to have done, and the poor use which the general dairymen have made and are making of similar opportunities, one is forced to the conclusion that better men are even a more urgent need than better cows. If the better men were on the farms the better cows would certainly follow. The material for the latter is already here, all graded and ready for men who can be taught to properly appreciate the use of it. Farm management is deficient in so many of its departments—particularly in that of "feeding"—that when the better bull is bred, his worth too often is never demonstrated because he is only a bull, after all, and has no say in the management of the farm.

What the Herd Test has Achieved.

A high individual yield in this herd test is evidence of a good cow; a high herd yield is evidence of good farm organization as well. These latter, appearing as they do in plenty again this year, are all instances of the human responsibility well shouldered. Considering the droughty nature of the past season it might have been expected that the year's records would not show out in the usual creditable light. In such a time herd-testing becomes a test of the owner as well as the cow. The fact that many of the owners have maintained undiminished yields indicates that they have attained a degree of professional proficiency which holds them above vagaries of the season, so embarrassing to the generality of dairymen.

Mr. T. Harvey's "Empress 2nd of Holmwood."

(Born 14.11.15.)

Season	Milk. lbs	Test.	Butter Fat. lbs.
1918-19	6,720	5·44	365·43
1919-20	7,594	5·10	387·66
1920-21	8,717	5·60	401·21
1921-22	8,067	5·57	419·70
1922-23	9,331	5·38	502·32

In scanning the long list of highly payable records and bearing in mind the severity of the dry spell which prevailed during much of the period, one must admire the mastery over feed difficulites which such yields represent—a mastery that was certainly unheard of, and almost as certainly unattainable, in the dark days which preceded the institution of herd-testing. The general dairymen of Victoria—even the long-experienced—have never yet shown themselves capable of such achievement, and here in this test we have young men, and men of comparatively short dairying experience, succeeding where outside veterans fail. What is the significance of this?

To the successful men themselves it is that they are pounds in pocket; to the officers of this Department, who have been holding this ideal before the dairymen of Victoria for a long time, it is that these men, in not presuming to conduct a dairy farm with untested cows, have had all the advantage which such precaution affords. A man is known by the company he chooses, and it is not mere coincidence that these men, who have most convincingly demonstrated the superiority of their efficiency, have all along made a point of associating themselves with herd-testing and herd-testers. If the standard herd test had not its other even greater purpose in the direction of breed-improvement, this comparatively minor function of educating its patrons to sustain good yields against adverse seasonal conditions would justify its establishment. It is safe to say that the practically undiminished production which has marked the leading tested herds this year was attained by few, if any, untested herds throughout the State.

Mr. T. Harvey's Group of four Jerseyholm Cows, all of which gave over 500 lbs. of fat in the 1922-23 Herd Test.

Reading from left to right—Lady Marge of Jerseyholm, Empress of Jerseyholm, Empress 2nd of Holmwood, Graceful Countess of Leicterfield.

Feeding—a Great Necessity.

The most successful dairyman is neither he who believes "it is all in the cow's quality," nor he who contends "it is all in the feed," but he who recognises the equal necessity of both animal-quality and feed. Such is the type of man who stands out among the owners in this test, as men of such convictions stand out above their fellow dairymen everywhere. It is a pleasing fact that owners generally who enter their cows in the herd test do possess, or at least soon acquire, a sense of the much that is due to a cow, and especially a tested cow, in the way of food. But there are always some who are more or less delinquents in this regard. These owners are not doing justice to themselves, the cow, or the Department. When we consider these chronic unprogressives, and the fact also that new herds are always coming in, there is in the following summary of the test's growth, abundant evidence that there must be substantial improvement in the great majority:—

SUMMARY.

Season.	No. of Herds.	Average Cows per Herd.	No. of Cows Tested.	No. of Cows in each Class.			Average Milk per Cow.			Average Butter-fat per Cow.			Year's Highest Fat Yield in each Class.			Average of Fat in each Class in Best Herd.			Best Herd's Average Fat on unity basis
				Mature Cows.	Post Heifers.	Heifers.	Mature Cows.	Post Heifers.	Heifers.	Mature Cows.	Post Heifers.	Heifers	Mature Cows.	Post Heifers.	Heifers.	Mature Cows.	Post Heifers	Heifers.	
							lb.	lb.	lb	lb.	lb.	lb.	lb.	lb	lb	lb	lb.	lb	lb.
1912–13	5	12	62	37	6	19	5,356	4,522	3,494	259	204	152	388	292	256	272	..	209	275
1913–14	16	14	217	141	41	35	5,809	5,243	4,949	261	256	241	585	409	[illegible]76	361	329	274	377
1914–15	21	16	335	169	59	107	6,420	4,937	4,349	319	258	211	766	499	446	431	369	400	430
1915–16	16	14	225	112	60	53	6,615	5,253	4,191	330	259	220	523	429	347	290	336	272	403
1916–17	21	13	271	172	37	62	6,397	5,458	4,829	317	287	255	542	426	347	445	355	285	424
1917–18	30	12	364	200	64	100	6,714	5,867	5,111	339	317	257	518	441	410	372	354	280	416
1918–19	52	10	499	269	87	143	6,937	6,386	5,405	340	314	276	577	519	494	420	413	366	448
1919–20	76	9	695	390	146	159	6,983	6,432	5,450	321	296	261	719	513	450	449	399	279	440
1920–21	87	10	832	427	187	218	6,657	6,051	5,068	308	283	239	581	582	427	457	468	339	446
1921–22	129	9	1,193	623	231	339	6,903	5,989	5,329	306	274	239	647	498	521	467	455	409	487
1922–23	150	9	1,373	646	299	428	6,806	6,010	5,158	306	271	253	616	524	486	467	524	354	472

The table shows that the average yield of the herds increased steadily during the first seven years, when the rise received a check by an influx of herds which came through their first year of testing very poorly. Similar herds have been entering since whose owners are not yet acquainted with more than the "spade-work" of herd management. It is not desired to write anything other than words helpful to any owner who is sane enough to test his cows, but no owner can hope for much betterment from testing who will not learn to provide his animals with the bare food-material on which they function.

We cannot get away from the fact that a dairy cow is a man-operated animal, and any owner who thinks his particular cows are so exceptional as not to require anything more from him than the extraction of their milk, may be assured that the animal that does not need to be fed does not need to be tested. The fact of the matter is that an under-fed cow cannot be tested in any useful sense of the word. Without the essential backing of adequate and sustained food supply the verdict of the test is worthless. This Department gladly acknowledges its obligation to owners who realize theirs, but does not wish to be a party to the farce of trying to estimate the respective merits of cows which the owners are not allowing to operate normally.

The responsibility for lowness of yield must rest either on the cow or on her owner. The cold type, however, of published records, visits failure all on the cow, which perhaps results in good useful blood being passed by and consequently lost to the industry. This is the last thing to be desired, but it is happening in some instances. As nothing worse would happen if such defaulting owners did not test at all, the exchequer would be well relieved of whatever cost they incur.

Poor records are excusable only in herds not long subject to the test. Even then they should be a spur to betterment. The owner is deserving of little consideration who cannot soon discover how much of the failure is due to under-feeding, or, in other words, to himself Once this is remedied and fair treatment otherwise assured, any deficiency still remaining must be ascribed to some of the herd being born other than dairy cows That is the plain fact. It is no good dwelling on the other fact that her breeding goes back to this or that prize-winner, or to a hundred of them for that matter, or even to a sire of producers. If the animal herself is incapable, that should settle it and her. She may be capable of breeding producers, but breeding experiments with such an animal does not befit an ordinary dairyman. All respect should be lost for her as a member of a commercially-run dairy herd, if profits from butter-fat are the consideration. This may be drastic, but, after all, it is the shortest cut to success in dairy farming to-day.

The year's results not only demonstrate the practicability of a dairyman rising superior to the country's only natural drawback, viz., dry weather; but they again bear out the experience of previous years, that it is his practical appreciation of but three factors—the breeding, feeding, and treatment of his milkers—which determine whether the business he is conducting is worth while or not. Where these three essentials receive due consideration the returns are all satisfactory, and *vice versâ.* Although the herd test is conducted as an aid mainly to the breeding side of the dairy farmer's business, it is incidentally serving to perfect the other essentials as well by its persistently presenting fluctuations of yield before the owner, that are attributable to food supply or treatment. This leads to more interested observation, and this in turn to increased discrimination, without which latter faculty our leading dairymen could not be what they are.

Close observation of milk records soon shows one how close is the connexion between food and milk. It is remarkable the number of men who can see a connexion between some peculiarity of the animal's conformation and her milk yield, and yet fail to realize this really vital one of food supply. If the same amount of attention that is now paid to type could only be diverted to feeding, some really useful reform would be effected in the industry. The lesson of the part played by food in milk production has been properly learned only when it brings one to realize that, although the payment is received per pound of butter-fat, the profits are really from the food which went to its making.

Mrs. E. M. Lennie's "Sweet Nell of Hillcrest."

(Born 29.10.12.)

Season.	Milk lbs.	Test.	Butter Fat. lbs.
1920-21	5,616	5·39	302·87
1921-22	9,767	5·17	504·64

It is not contended that any cow can be made into a good yielder by simply giving her more food. Where such an extreme idea is held—and it is surprising the number and class who profess to hold it—there is nothing more likely to dissipate it for ever than a regularly recorded milk chart. While the scales and tester will soon teach one that for good results a cow of special nature must be bred, they at the same time show that no milk is ever yielded, however suitable the cow, without a sufficiency of the right ingredients being first consumed. Milk has only two sources—the air and the food. Air costs nothing, which explains why fewer cows are suffocated than starved. Once a man discovers that the food is the material from which milk is mainly made, he soon comes to realize the uselessness of having incurred all the other necessary dairy farming costs, if this first essential is to be withheld. Yet this fundamental fact of his business—that milk is mainly converted fodder—remains either undiscovered or ignored by the generality of dairymen. This would appear to stamp them as an unusually ignorant class, but their ignorance on this matter is largely shared by cattle dealers, cattle salesmen, and cattle men generally. Superior to the average farmer as these men may be in matters of commerce, few indeed among them all realize that the dairy animal in which they commonly deal is merely the transforming machine, as useless without a sufficiency of food as a puddling machine without clay.

There is too much of a tendency right through the stock-trading classes—who most constitute the dairyman's associates—to belittle the herd records that are obtained by a dairyman's superior intelligence in the way of hand-feeding. The purchase of bran for dairy cows is spoken of as almost the act of a simpleton. Even a man who trusts solely to pasture is considered a saner fellow.

If this country had no fodder alternative to pasture to offer its dairy cows, it is safe to say that the most successful dairymen in the State to-day would be quick to choose some other means of livelihood. No other class in Victoria except those at present so engaged, could be driven to attempt such folly. If it were not for the increment in land values—called " unearned " by some critics—the negligence of the average farmer to properly feed his cows might well have cost him his farm. Some dairymen there are who stretch their generosity so far as to allow their milking cows any stray hay or straw that the horses will not consume, or that cannot be otherwise disposed of, but the number who appreciate that there can be no satisfactory milk production without an equally satisfactory food supply is few, and is increasing all too slowly.

As long as good cows can be bred—as is being done by our testing owners to-day—that convert all the food above their own body needs into milk, their owner need never worry how busy they keep him filling their manger with foodstuffs, produced mainly on the farm. Such cows' food limit may well be left to their appetites to determine, and their owners may still smile on. The profits of butter-fat being the result of food, it is poor policy to curtail the supply. Rather should one hope he could induce his animals to eat more.

The Cow—A Machine for Producing Milk.

After all, what is the dairyman for? It so happens that human taste is more for milk, butter, and cheese than it is for the grass, chaff, and bran, of which they are made, and quite an extensive industry is required to effect the change. A special machine is used—the dairy cow.

It is many, many years since she was first devised, and human designers have been at work on her almost ever since, till to-day we have all sorts of models, varying from the ought-to-be-scrapped to the almost incredibly efficient. Her designer is the breeder; her lubricating oil human kindness; her fuel is the carbohydrate and fat ingredient in the food she eats, while the raw material she operates on, to process into milk is the protein and mineral ingredients of the same. If sufficient is not available to her, she does the best she can without it, and her owner does the best he can without the valuable product—butter-fat—it would have made. Some protein and mineral are retained each day to rebuild the machine's parts as they become worn, but any surplus will be converted into milk by an efficient and properly attended machine. The carbohydrate and fat are used as fuel because they most readily combine with oxygen inhaled by the lungs to bring about the burning which heats her and drives her working parts. In the food this fuel material is represented by the carbon and hydrogen compounds —starch, sugar, and fat. The latter is a concentrated fuel, meant mainly to meet emergency strains, as in extremely cold weather, when the body's demand for heat exceeds the amount that lower-powered starch and sugar could generate.

Mr. P. J. Maloney's "Wattle of Springhurst."
(Born 16.7.15.)

Season.	Milk. lbs.	Test	Butter Fat lbs.
1917-18	5,768	4·98	287·37
1918-19	6,763	4·73	319·66
1919-20	5.529	5·27	291·54
1920-21	8,092	4·69	379·91
1921-22	9,619	4·95	476·33
1922-23	11,614	5·01	582·39

In purely mechanical machinery man burns carbon (coal or wood) for generating the power, but in an animal's furnace carbon as such is not combustible or digestible, so that for the animal system we must use the edible form of it, which is carbon that has been so combined with water by living plant cells as to make it both tasty and digestible, and thus serviceable as body fuel for animals. The carbohydrate which serves as fuel of the cow is thus edible carbon. It is most economically supplied in the form of comparatively coarse or stalky plants, such as the pasture grasses, oaten hay or ensilage, maize (green or as ensilage), and lucerne hay, which class of food is commonly called roughage. Where good grass and clover are available in abundance, practically nothing more is required. Roughage is comparatively easily obtained, and even when dry, less than a full stomach of roughage of good quality is quite effective as the fuel, or mere driving force, of the animal machine; but it is wasting the time and up-keep of a good machine to supply it with only driving power while withholding the material on which it exercises its transforming function. It is equally foolish to limit an efficient cow to the ordinary roughage for milk production, though if her stomach is kept filled there will be always some protein available and digestible enough even in this class of food to make some milk.

The efficiency of roughage for this double purpose deteriorates greatly with advance of the ripening process or increasing dryness. In a nutritious class of plant like ryegrass, clovers, lucerne, or even oats, greenness will so help the digestibility as to make such foods almost independent of all other aid, provided the full appetite can be satisfied. When at their very young and green stage, these plants are not ordinarily referred to as roughage. The word is used generally in connexion with hand-feeding, and refers usually to cured or relatively ripe plant matter. This coarse food, except when in its most digestible green condition, has its proper function in maintaining the animal economy in a state of fitness and efficiency, apart from any work done in the way of milk production. Maintenance, as distinct from production, is its function. This means that it must serve to maintain the animal's body heat at 101½ degrees whenever the surrounding air is below that temperature; drive her heart, lungs, bowels, legs, jaws, tail, ears, and eyelids, &c.

For milk production, in the absence of nutritious greenstuffs at their best, protein can be provided in a much more effective medium than that of roughage, and it is protein that must be used. Milk cannot be made without it. Ordinary roughage contains comparatievly little protein. No purpose is served by supplying in bulky association more than sufficient protein to restore the wear and tear of the working parts. Too much space has to be occupied for the good done.

A heavy milker's stomach-space that remains after maintenance requirements have been met can be used to much better advantage by charging it with foodstuffs richer in the milk-making ingredents, and this foodstuff is known as concentrate, because it contains much complete nutriment in small compass. What makes the concentrates so complete is their high percentage of protein. We need not go into the chemical composition of protein further than to say that its chief distinguishing characteristic is that it contains nitrogen—an extra ingredient—which has been made assimilable to animals by the plants in which it was formed, a process which vegetation performs much more sparingly than the making of carbohydrate. Hence proteid foods cost more money to procure.

All food for milk-making—that is, all food over maintenance—should, in hand-feeding, and in the absence of abundant nutritious green feed, take the form of concentrates. This class of nutriment is chiefly represented in ordinary feeding stuffs by wheat-bran, pollard, the grains of peas, wheat, oats and barley, linseed (meal or cake), and maize polly-feed. The grain stuffs must be finely crushed for ruminating animals, as otherwise much goes right through the digestive tract undigested, and consequently unused.

Except mineral (mainly lime) and a certain food principle connected with greenness, the concentrates contain practically all the food ingredients an animal's body requires; but it never pays to use concentrates for moving the machinery, or maintenance, because roughage, which is cheaper, performs this function just as well. The two classes of foodstuffs should be regulated to their respective functions.

To make clearer the attempt at definition, the chemical analyses is here given of a common roughage (oaten hay) and a common concentrate (bran), so that the disparity in protein may be noted:—

—	Protein	Carbohydrate	Fat
	lbs.	lbs	lbs
100 lbs. Oaten Hay contains ..	4·5	43·7	1·5
100 lbs. Bran contains	11·2	42·2	2·5

Although the same weight of oaten hay (or chaff) has less than half the protein of an equal weight of bran, its bulk would be about twice as great, so that to supply the same amount of protein by means of chaff four times the receiving space would be required. Oaten chaff, as usually fed loses anything from a third to a half of its grain in the dung, so that if an attempt is made to substitute it for bran as milk-making ingredient, nearly eight times greater bulk of food material would have to be used. This, on top of that already required for maintenance, makes the consumption of sufficient chaff for a high yield a physical impossibility. The disability of roughage such as chaff is further increased by the fact that the nitrogenous ingredients contained in the leafy portion and the stalk of plants is not so assimilable as the protein of grain or bran, so that even more than eight times by measurement would be needed to supply the same amount of ingredient for milk.

This illustrates at one and the same time the function of food concentrates like bran, and the folly of any man who expects to keep a good cow working at her full capacity without one or other of them. As an in-calf cow advances in pregnancy, some additional food is naturally required, and this can well be concentrates. Concentrates can certainly be used unprofitably, as when they are applied to do work worthy only of cheaper roughage, or when they are thrown away in the attempt to produce milk in an animal not designed for this purpose.

Green feed like lucerne or oats is a great adjunct to any ration. Even alone, its greater solubility, making possible a far quicker passage through the bowels, enables a cow to fill up again and again, and thus extract an amount of nutriment in a given time in excess of many foodstuffs of better analsyis. Its action is thus like forced draught or oil fuel in boiler furnaces. There is a further principle in leaf-green known as vitamin, which exerts a favorable influence on the digestibility of mineral matter so essential to milk production and nerve tone of the animal. Milk is richer in lime than is lime-water, and there is no doubt that the supply of adequate lime in digestible form is one of the dairyman's chief problems. None of the cereals contains sufficient. Legumes like clover and lucerne, which are not always at command, are thus his only chance of avoiding a deficency. It is, therefore, of particular importance to insure the assimilation of whatever lime ingredient the ration may contain, and there is no better way than by the inclusion of at least some green leafy fodder in the ration at every opportunity. The farmer should make it his aim to encourage natural clover, and should grow green crops like oats and millet, or better still, lucerne, or even soya bean, with their high lime content, well nigh indispensable if, year in year out, high production is to be maintained.

Messrs. Flack & Sewell's "Dominion Queen Mercedes."

(Born 2.10.16.) [Photo. by W.R.C.

Season.	Milk. lbs.	Test.	Butter Fat. lbs
1919-20	10,295	3·42	352 02
1920-21	9,063	3·64	330·23
1922-23	15,938	3·69	589·53

Mention has been made of the "milking" cow that is incapable of producing much milk however fed—the model that ought to be obsolete on dairy farms, and which it is hoped cattle-breeders will eventually breed either into a beef animal altogether or else out of existence. Dairymen have never yet assessed this beast down to her true relative value as a milking proposition.

Take the average cows in the Mirboo North district herd test, whose owners are progressive enough to have them tested. Their yield was about 180 lbs. of fat. It would be interesting to know what area of land cows have the run of in that district and its selling price per acre. It may be cheaper than in most parts of the State, but in general a cow that is pasture-fed requires £100 worth of land for maintenance only. This makes a cost against her of £6 a year at least for her food.

Let us suppose that a dairyman who cultivates no land could attend to a herd of sixteen cows for the ordinary dairy employee's wage of £130 a year; that is to say, £8 per cow for labour. Rates on the property and risks on the animal must be allowed another £1 per year. At any rate, by no possibility could a cow yielding 180 lbs. of butter-fat, even on pasture, be estimated to cost her owner less than £15 a year. This sum is nearly enough covered by the yield mentioned, but no more, and what value does it give the cow? The 180 lbs. cow is just quits with her owner at the end of the year. She returns him no greater wage than he could have received from an employer without her. Therefore the value of a 180 lbs. cow to her owner is the sum that could be obtained for her carcass and hide as she stands.

As a dairy cow it is nil. The prices which proven good cows bring may look high, but when compared with what comparatively worthless cows bring in the market, are out of all proportion, low. Until a cow's yield reaches the point where profit over costs begins, she has no value as a dairy cow, but her value then immediately commences to increase The annual costs are practically the same for a 180 lbs. cow as a 190 lbs. one, yet there is, say, 15s. greater return from the latter. This, capitalized at 5 per cent., makes £15, and the only difference in risk is the extra premium an insurance company would charge for insuring one cow for £15 more than the other. Assume it charges half, or £7 10s. per year premium, this leaves the 190 lbs. cow worth the remaining £7 10s. more than the 180 lbs. animal. Yet what dairyman would be courageous enough to give that sum for only 10 lbs. a year greater butter-fat capacity?

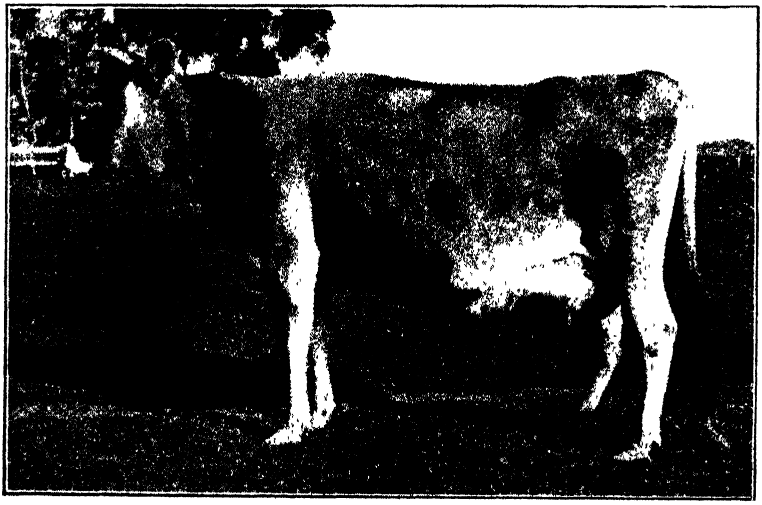
Is it the same want of courage which makes so many hold back from buying a really good bull? A dairyman near Bendigo, adopting the obviously best means of improving his herd, purchased a pure-bred bull of a high producing family. The bull had to be brought from the other district by train. The neighbours regarded the purchase as an act of extravagance. On seeing him being detrained, one wanted to know what the freight cost. He was told £2 10s. "You fool," was the answer; "you could have bought a *bull* in Bendigo cattle market for that."

Review of the Year's Work.

The year was completed with a record of 1,373 cows tested, of which 1,054 qualified for certificates, leaving 319 defaulting animals whose milking worth is at least suspect. The number of herds in which cows were tested was 150. Of these the number containing over ten cows was 48. Provided a herd contains over 10 cows which average over 300 lbs. of butter-fat, the owner is qualified to compete for the prize awarded for the best herd. Only 28 of the herds were able to comply with the latter condition, as compared with 24 last year.

The prize was won by Mr. T. Harvey's herd of Jerseys, which, however, failed to quite equal the record of the winners last year. There is nothing discreditable in this, because the record then obtained by Mr. Mesley's Jerseys was so exceptionally good that it would have been expecting too much to see it surpassed so quickly. Mr. Mesley's returns do not appear in the herd competition this year, because his herd contained one less than the requisite number of cows.

The winning record this year of Mr. Harvey's herd was 471.82 lbs of butter-fat per cow. It is a performance to be proud of. The owner has been well in the running for the prize for several years now, being in third place last year with 418 lbs. of fat, and second the year before with 441 lbs. Mr. Harvey has been known in this Department for some time as one of the most efficient dairy farmers in the State He is one of the younger generation of dairymen, and is essentially of the new school. If he were adopting a motto, none would suit him better than "Excelsior." The State possesses no finer example of what is possible to a man on the land who has the ability as well as the will to take full advantage of the opportunities of the calling; but it is hardly much use quoting his achievements, because one finds so few men contemplating dairy farming who have anything like the natural qualifications to imitate him.



Mr. T. Harvey's "Lady Marge of Jerseyholm."
(Born 13.4.15.)

Season.	Milk lbs.	Test.	Butter Fat. lbs.
1917-18	4,868	5·80	282·64
1918-19	6,496	6·43	417·80
1919-20	7,339	6·09	447·21
1920-21	7,576	6·10	462·05
1921-22	7,263	5·93	430·42
1922-23	8,056	6·27	505·32

In Mr. Harvey's hands the farm and the farm animals are managed as they should be, and what more can be said of managing ability anywhere? It is about ten years since Mr. Harvey, after previous experience at butter factory work, took up the closer settlement block of the rich Boisdale Estate on which he has attained all his success. The area was 40 acres, all river flat, which Mr. Harvey found insufficient to keep him fully occupied. It was not long before he acquired another 40 acres quite handy, and it is doubtful if there is another 80 acres in the State which has been made to give such satisfactory returns in the way of dairy produce.

The Babcock tester was made an auxiliary from the beginning, and it was not long before Mr. Harvey had a herd of about twenty, all profitable animals. His experience with the grade Jerseys soon infected Mr. Harvey with what he himself describes as "Jersey" fever, and the grades one by one gave place to the pure, all but one which is retained for her extraordinary producing worth.

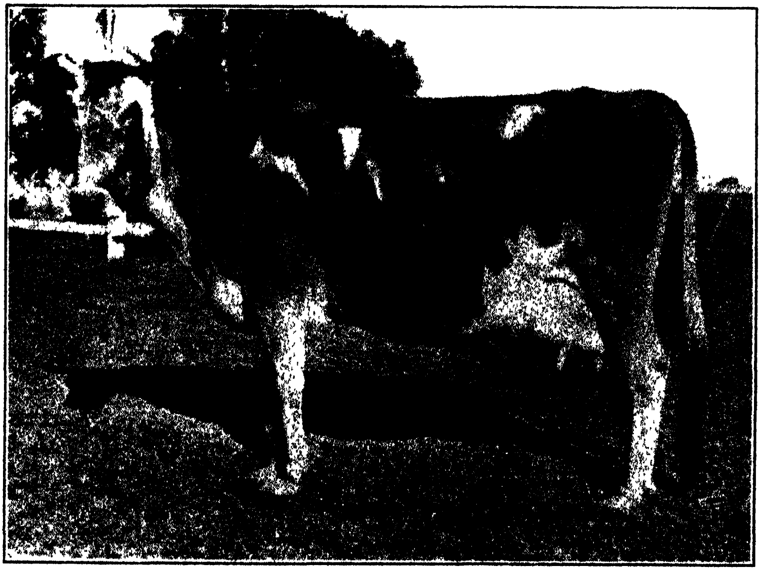
The cows are kindly treated. In fact, the position of the herd to-day is due just to Mr. Harvey's unrelenting insistence on the best possible in the way of the three essentials—breed, food, and animal comfort. He has no mysterious or magical method. Given the same sagacity to understand, the same will to execute, and the same industriousness to keep at it, there is no reason why every dairy farmer in the State could not be getting the same butter-fat yields from his cows as this young breeder. But perhaps that is too much to expect in present circumstances.

The animals on Mr. Harvey's farm are protected by rugs when conditions require it, which are also removed when animal-comfort suggests it. All the bulk food is home-grown, and reserves are always on hand. The cows depend mainly on oat and maize crops. The former is used by grazing in its growing stage, and later conserved as hay and also as ensilage. A little immature maize may be used for its greenness when such is required, and some also fed green when near the mature stage, but the crop is practically all conserved by ensiling. In conserving the oat crop as hay, Mr. Harvey follows the always wise course, with cow-feed, of cutting it very early. The cows thus get nutriment which would otherwise be lost in the imperfectly masticated grain. The usual ration used, when hand-feeding becomes relished, is as much oaten chaff or ensilage (maize or oats, according to season) as the cow will eat, in addition to whatever amount of milk-making concentrate has been proved to be most economical. This, Mr. Harvey finds, varies from 5 to 12 lbs. per day, according to the natural capacity of the animal and also to her stage of lactation. The concentrate used consisted only of bran, crushed barley, and linseed-cake meal. Moderate amounts are mixed in with the chaff about twelve hours before using, damped, and covered with bags to warm. Increases, due to the deserving animals, are made separately when feeding The Boisdale district enjoyed a good spring, but the autumn was extremely dry. Cropping and conservation overcame this difficulty, and the "drought" passed over the herd without leaving a scar.

Mr. Harvey's first venture with pure Jerseys was made with the purchase of a "Carnation Fox" bull, from Mr. George Chirnside, to mate with his grade cows. Later he obtanied a young bull ex "Wilful Venture", a "Wild Rover" cow, two removes from Mr. Woodmason's famous old cow "Jessie's Progress." "Wilful Venture's" fine record (380, 431, 480 lbs. fat), in the herd of Mr. P. E. Keam, one of the first entrants to this herd test, in 1912, attracted the young breeder's attention, and he had courage enough to pay the price for a bull of such meritorious blood. Two of the cows in the winning herd, "Bluebell of Jerseyholm" (437.2 lbs. fat) and "Kirsty 6th of Jerseyholm" (441.73 lbs.) are by this bull.

Later Mr. Harvey procured a young bull named " Emperor " (964) by " Handsome Boy 3rd of Melrose " (1577), a son of " Pretty Noble." " Emperor's " mother, " Empire 5th of Melrose," was one of Mr. Woodmason's consistent and high producers, and was a daughter of " Pretty Noble." This bull " Emperor " has sired six of the herd's eleven cows.

The herd's best cow, " Empress of Jerseyholm," which has yielded 524.44 lbs. fat on only her second calf, is out of an " Audrey Lord Twylish " cow, " Empress 2nd of Holmwood," mated with " Emperor." The blood of two famous bulls has thus met in this fine young cow. " Emperor's " blood becomes linked up with that of " Venture's Hero " in another daughter, " Kirsty 8th of Jerseyholm " (465.89 lbs. fat). " Lady Marge 2nd," which, on her first calf, has yielded 404 lbs. of fat, is also by " Emperor."



Mr. T. Harvey's " Graceful Countess of Lesterfield."

(Born 22.9.16.)

Season.	Milk. lbs.	Test	Butter Fat lbs
1918-19	4,776	6 55	312·72
1919-20	5,443	6 91	376 20
1920-21	5,378	6 33	340·25
1921-22	5,851	6·01	351·50
1922-23	8,924	5·85	523·31

A double cross of " Emperor " is seen in another fine heifer, " Sparkle 4th of Jerseyholm " (392.85 lbs.) through her mother, " Sparkle 3rd " (371.40 lbs. on first calf), and her sire, " New Alliance " (1368).

The above represents the attention which has been given to the " breeding " side of the business, and furnishes but another of the many instances of the hereditary transmissibility of dairy character and how it can be exploited by one recognising it. It all comes of being "fool" enough to buy a pure bull of high producing blood instead of the type of Bendigo bull previously referred to.

TABLE SHOWING PROGRESS OF THE PRIZE-WINNING HERD.

Season.	Average Yield of Butter Fat per Animal.		
	Heifers.	Post Heifers.	Mature Cows.
1915–16	278	310	None in test
1916–17 ..	315	357	388
1917–18 . ..	283	346	394
1918–19 . .	308	418	347
1919–20 .	322	370	418
1920–21 .. .	321	410	443
1921–22 ..	334	395	399
1922–23 ..	354	524	467

Messrs Jones & Sons' "St. Alban's" herd of Friesians are in second position, and if their breeding be traced, it will be found that each animal has united in its "make-up" the blood of animal after animal of similarly high production.

It is the aim of this herd test to have only such "producing" blood, irrespective of breed, used in every dairy herd in the State in which young stock are reared. It is no good hoping for an easier way. At any rate, it is a much easier way than that in which the dairyman who will not adopt it must continue to flounder.

The Best Cows in the 250 lbs. or Mature Cow Class.

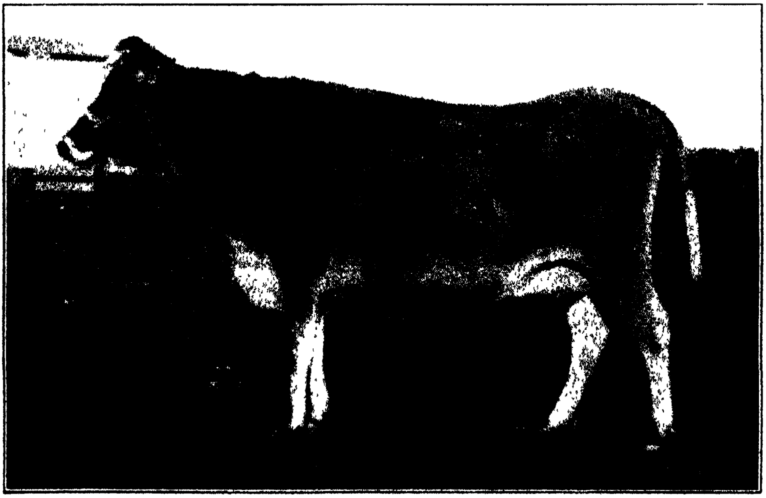
The record of the leading cow this year is 615.51 lbs. Ragtime of Warenda, the cow which has exceeded all her fellows this year, is owned by Mr. T. Mesley, whose herd broke all records last year. We have not the satisfaction of publishing Mr. Mesley's herd record among the competing herds this year, because of the herd being one cow short of the requisite number.

Ragtime's ability is now well known. In her heiferhood days she topped the list with 427.24 lbs. fat, and the following year got into second place with 482.14 lbs. She possesses a remarkably high test, the last four tests of her last lactation going over 8%. She is out of Mr. Mesley's tested cow Pibroch (5256), 469.07 lbs., a grand daughter of old Music, by Skim of Dunalister (1227), and is by the Melrose-bred bull, Jessie's Handsome Boy (1011), two bulls whose merits were extensively mentioned in last year's report among the comments on Mr. Mesley's success.

In second place with 596.24 lbs. is Mr. C. D. Lloyd's Werribee Starbright 9th, the cow which on her second calf topped the list over all the aged class cows two years ago, and following it up last year with another fine record of 511.44. She was bred by Mr. Geo. Chirnside, as her name indicates, and is by his imported bull, Island Butter King (929).

In third place the breed changes from Jersey to Friesian in Messrs. Flack and Sewell's fine producing cow, Dominion Queen Mercedes (589.53 lbs. fat), which yield, following on the famous performance of her half-sister, Dominion Segis Fobes, last year, is another testimony to the valuable prepotency of their sire in common, Woodcrest Jo.

Mr. P J. Maloney's Czarina, of Springhurst, which brings the descent in order of merit back to the Jersey breed, is a cow we have heard of before. The yield of 583.30 lbs., by which she holds fourth place this year, is her seventh tested lactation, her previous best being 536.84 lbs. She is out of a cow whose progeny are standing out as producers wherever they are being tested, viz., Princess of Springhurst, a cow which herself stood out as one of the best in Mr. J. D. Read's herd in the early days of testing.



F. Trevaskis' "Miss Guy of Tarnpirr."

(Born March, 1920.)

Season.	Milk. lbs	Test.	Butter Fat. lbs.
1922-23	7,422	6·08	451 54

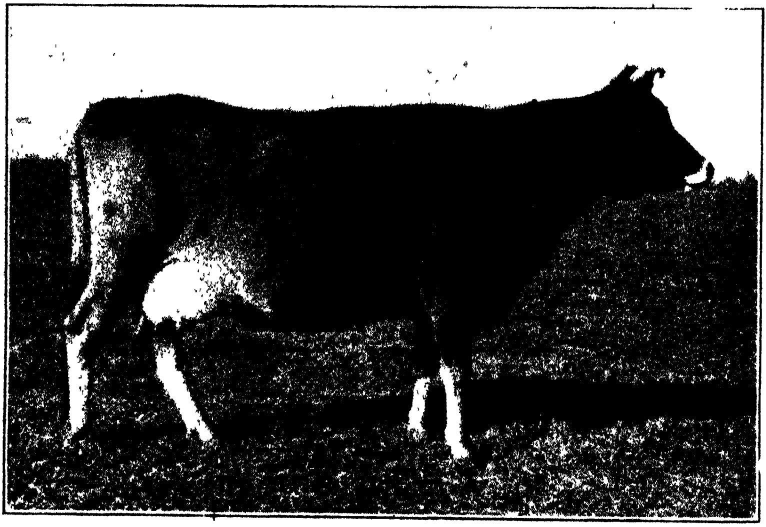
Another great producer of Mr. Read's breeding, now in Mr. Maloney's good hands, is the fifth place cow, Wattle of Springhurst, which has yielded 582.39 lbs. on this, her sixth lactation.

Figuring in sixth place is another representative of Mr. T. Mesley's in Keynote (537.05 lbs.), by Skim of Dunlister, out of Harmony 2nd. Skim of Dunlister's success as a begetter of high producers is already well known.

Seventh place is held by the Department's consistent Friesian, Dominion Hyacinth, with 535.98 lbs., and eighth place by another animal of the same breed, the now familiar May Queen 2nd, belonging to Messrs. Jones and Son. The latter has five fine lactations to her credit in this test, reaching on one occasion 616.61 lbs., when she was third top cow. She was also highest heifer in her year.

The cow occupying ninth position is Mr. T. Harvey's Graceful Countess of Lesterfield, 523 lbs. fat, by Handsome Boy 3rd (1577), a son of Pretty Noble (imp.). This cow has thus the same sire as "Emperor," and, as her name indicates, comes of the Melrose family of Graceful Duchesses, being, through her dam, but two removes from old Graceful Duchess 8th, one of the very best of that high producing ilk.

Some reference is again due to Mr. A. W. Jones' 12-year old cow, Jubilee 15th. For six years now this old consistent performer has shown up in the records, being thirteenth in 1917, second in 1918, fifth in 1920, nineteenth in 1921, sixth in 1922, and tenth this year. Her average butter-fat over the six official lactations is just 500 lbs.—the best record of any cow over that extended period. She is by the old-time bull, Navigator, the sire of many high producers.



Mr. T. Harvey's "Empress of Jerseyholm."

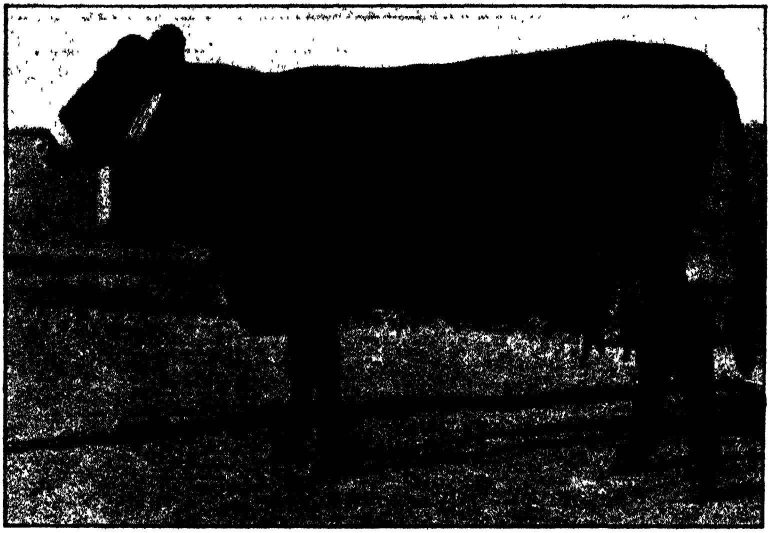
(Born 23.7.19.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1921-22	6,890	5 81	400·43
1922 23	8,952	5 86	524·44

The breed changes again with the eleventh place, this being held by Messrs. Dickinson's Friesian "Pauline of Ashby" (514 lbs. fat), which again appears as their star performer. It only shows what there is in inherited capacity, when the same cow shows out year after year over herd mates like this. In twelfth place, the Red Poll's representative, "Tonga" (513 lbs. fat), of the Department's Werribee Research Farm herd, enters the lists—another fine instance of consistently superior production. The 505-lbs. yield of Mr. Harvey's "Lady Marge of Jerseyholm" brings the Jerseys again into line. These Lady Marges have an interesting pedigree. This 505-lbs. cow, mother of the

" Emperor " heifer, " Lady Marge 2nd," has for her parents a son and daughter of Sweet Fox, and on the Lady Marge side comes down from the old-time imported " Black Antimony 360, which bull was probably responsible through his son, Garantie's Antimony 715, for the high-producing quality of the Lady Greys and other of Mr. Jones' creditable performers that were close up to him in their pedigrees. The way in which production is associated with prior production is each year becoming more marked. So linked up now are the blood lines of our high producers that the ramifications are almost too bewildering to trace back further than a few generations.

The next cow (14th) on the list, " Sweet Nell of Hillcrest " (504.64 lbs. fat), owned by Mrs. Lennie, is by Black Prince of Mt. Crawford 1191, also a descendant of Black Antimony (imp.).



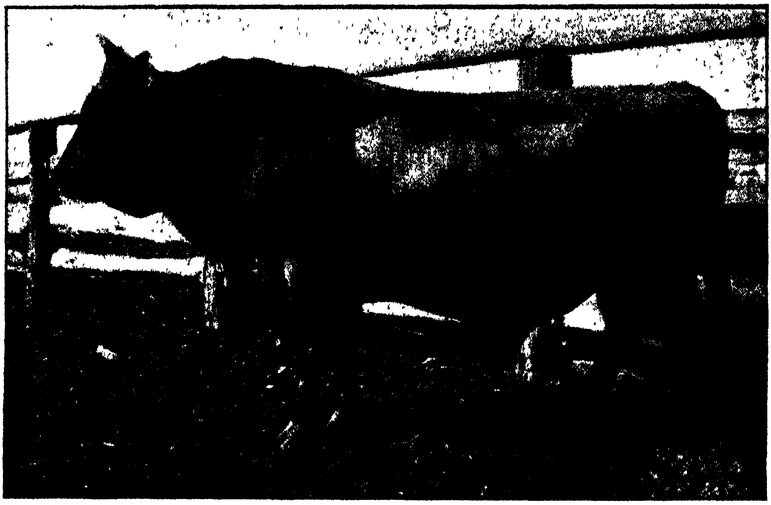
Department of Agriculture's "Tonga."

(Born 23.5.13.)

Season.	Milk. lbs	Test.	Butter Fat lbs
1916-17	6,452	4·53	292·74
1917-18	8,290	4·21	349·04
1918-19	8,841	4·34	383·83
1920-21	9,986	4·24	423·83
1921-22	10,066	4·06	408·44
1922-23	12,306	4·16	512·90

The Department has another Red Poll in " Latakia " to exceed the 500-lbs. mark. She was by the successful sire " Nicotine," and had " knocked up " five good records to her credit before her premature death last year. An " Audrey's Lord Twylish " cow comes sixteenth. This is Empress 2nd of Holmwood (502 lbs. fat), dam of Mr. Harvey's highest yielding herd member this year. And so the connexion between one high producer and another can be traced right down the list much further yet, but space forbids. A record worthy of special note, however, is the 423.65 lbs. of the 14-year-old veteran, " Flower 6th of Melrose," in Mr. Woodmason's herd. This cow is by " Royal Blue," one of Mr. Woodmason's prepotent herd-series of the long ago. Flower's lactation, which appears this year, is her ninth in this test, and the figures are of real interest and value—

Calved.	Milk.	Test.	Butter Fat.	Milk Last Day.
	lbs.		lbs.	lbs.
23.11.13	6,002	5·77	346·18	19
11.10.14	5,274½	6·14	324·17	13
2.11.15	7,109½	5·50	390·72	21
7.12.16	6,867	5·50	377·94	22½
8.3.18	7,933	5·55	439·23	27
30.4.19	8,486	5·24	444·[illegible]	25
17.5.20	8,503	5·20	442·51	22½
14.6.21	8,122	5·17	420·08	22½
23.7.22	8,292	5·11	423·65	19



Mr. T. Harvey's Emperor (964)—the sire of the majority of the animals of the Winning Herd.

Another good performance as an "old buffer" is that of Mr. J. G. Lobb's Ayrshire, "Maud 2nd of Holly Green" 4773. At 19 years she has just completed a yield of 6,485 lbs. of milk, with an average test of 4.62, making a fat yield of 299.87 lbs.

The 200 lbs. or Post Heifer Class.

In this class there are two cows to exceed 500 lbs. of fat, viz., Empress of Jerseyholm, before referred to, and Mr. C. Deverell's "Gold Bell of Methven." The latter's yield of 516.22 lb., following on one of 413-lb. as a heifer, makes her a very promising class of animal. She is by "Bloodshot of Tarnpirr," who in turn is by "Morocco's Carnation Fox" (500), which bull left so much good stuff at "Tarnperr," which has since become introduced into many various herds of the State, through the dispersal of that stud.

175 lbs. or Heifer Class.

In view of the fine records put up by Mr. Mesley's herd in late years, there is significance in two fine records at the top of the heifer order of merit. These—the first and third—are two typical "Warenda" producers transferred to a new district, and repeating their achievements there. The first is "Patricia of Warenda" (486 lbs. fat) by Jessie's Handsome Boy out of Alsyke of Springhurst, the dam also of "Agnes of Warenda," last year's record heifer. The other, in third place, is "Lady Lauder of Warenda," by Choirmaster of Warenda, out of "Ragtime of Warenda," top cow this year. It is pleasing to see young men making good, and the success of Mr. Trevaskis' heifer, "Miss Guy of Tarnpirr," which obtained second place in the heifer's list with a yield of 451½ lbs. fat, should convince the owner that he was not ill-advised in adopting pure-bred cows for his dairy farm. The cow combines "Melrose" and "Tarnpirr" blood, going back through the former to her great grandsire, "Pretty Noble" (imp.).

All are advised to study these heifer records as they descend in merit. There are numbers of them which cannot be referred to here, but which, nevertheless, do the pedigrees credit. Such blood can be recommended to any one looking for a young bull with which to breed-up the herd yields to payable dimensions.

During the year 44 new herds have been entered for testing. The names of the owners are given as follows, under the cows' respective breeds:—

Jersey.

F. Austin, Avalon.
W. H. Axford, Camperdown
J. E. Chadderton, Hamilton.
Clyne Bros., Tinamba.
E. O. Cudmore, Coldstream
H. Dettmann, Kyneton
P. P. Ducat, Shepparton.
S. Earle, Merricks.
A. E Fewster, Nilma.
W. Fixter, Boisdale.
Fixter and Sons, Boisdale
Gibson Bros., Trafalgar
R. J. Henry, Euroa.
J. A. Huffer, Gormandale.
G. H. Jones, Clyde.
K. McGarvie, Pomborneit
D. Peter, Mornington.
R. Purnell, Moriac.
A. Robertson, Tooradin.
W. B. Ronald, Pakenham East.
R. Vict, Trentham.
C. Wade, Camperdown.
F. E. Wilcox, Lilydale.

Shorthorn.

S. T. Algie, Murraydale.
S. H. Ebery, Newstead.

Friesian.

H. Allez, Tatalia.
J. Carter, Marong.
R. Ferguson, Riddell.
Flack and Sewell's Balmerino Dairy.
E. Talbot Jones, Clematis
Red Cross Farm, Janefield.
Smith and Sons, Woodend.
A. G. Tedcastle, Toolern Vale
J. F. Williams, Yinnar.

Ayrshire.

A. E. Castle, Swan Hill.
J. Ingram, Sunbury.
J. G. Lobb, Clyde.
Longerenong Agricultural College.
E. O'Donohue, Kilmore.
J. F. Tuckey, Alberton.

Red Poll.

Evans Bros., Lima East.
J. T. O'Loughlin, Dandenong
Warragul High School.

STANDARD COW PRIZES, 1922-23.

The following prizes are offered by the Government for the year ended 30th June, 1923. The prizes will be awarded through the Royal Agricultural Society:—

1. *Grand Champion Cow*—under Herd Test Regulations.

   A grand champion prize of £100, as a trophy or cash, for maintaining the position of annual champion for three years, not necessarily in succession. (Not yet been won.)

2. *Annual Champion Cow*—under Herd Test Regulations.

   A prize of £10 to be awarded to the cow which, during a lactation period terminating within a year ending on 30th June, gives the greatest amount of butter fat under the Herd Testing Regulations of this Department.

   Won by **Ragtime of Warenda.** Owner, T. Mesley.

3. *Reserve Annual Champion*—under Herd Test Regulations.

   A prize of £5 to be awarded to the cow attaining second place, under the Herd Testing Regulations of this Department, during the year ended 30th June.

   Won by **Werribee Starbright 9th.** Owner, C. D. Lloyd.

   These prizes to be awarded conditionally upon the winning cow being exhibited at the next Royal Agricultural Show. In the event of the death of the winning cow prior to such Show, the owner is to exhibit his next best cow.

4. *Best Herd*—under Herd Testing Regulations.

   A prize of £20 and a second prize of £10 to be awarded to the herds giving the greatest average returns under the Herd Testing Regulations of this Department, and complying with the following conditions:—

   (1) A minimum of ten cows to complete the test during the year.

   (2) Such herd to average not less than 300 lb. of butter fat. Handicaps to be allowed on the following scale: —

   (*a*) A herd of more than 10 cows to receive a handicap per cow of an amount of butter fat equal to ½ lb. for each cow in the herd.

   (*b*) Cows entered under Regulation 6a to receive a handicap of 75 lb. of butter fat.

   (*c*) Cows entered under Regulation 6b to receive a handicap of 50 lb. of butter fat.

   The prizes to be allotted for the year ended 30th June, and three cows of the winning herd, are to be exhibited at the next Royal Agricultural Show, with placards setting out their respective butter-fat yields.

   First prize won by the "Jerseyholm" Jersey Herd; owner, **Mr. T. Harvey.**

   Second prize won by the "St. Albans" Friesian Herd; owner, **Messrs. A. W. Jones & Son.**

No cow may compete for any prize unless she re-calves within fifteen months from her previous calving date.

HERD AVERAGES.

Detailed Returns of the two Prize-winning Herds.

1st. Mr. T. HARVEY'S "Jerseyholm" Herd (Jersey).

Cows of the Herd in their Respective Classes		Butter Fat.	Average Fat per Cow.
		lbs.	lbs.
7 Mature Cows yielded		3,268·08	466 87
1 Second-calf Cow yielded	524 44 lbs	..	524 44
Handicap of 50 lbs. each	50 00 „		
		574·44	
3 Heifers yielded	1,062 03 lbs.	..	354 01
Handicap of 75 lbs. each	225·00 „		
		1,287 03	
Butter fat return from herd (without herd allowance)		5,129·55	
11 Cows in herd allowed 5½ lbs. each (the ½ lb. allowance per cow)		60·50	
Herd total of Butter fat (including all handicap allowances)		5,190 05	**471·82**

2nd. Messrs. A. W. JONES & SON'S "St. Albans" Friesian Herd.

Cows of the Herd in their Respective Classes.		Butter Fat.	Average Fat per Cow.
		lbs	lbs.
9 Mature Cows yielded		3,576 74	397·42
9 Second-calf Cows yielded	3,412·21 lbs.	..	379 13
Handicap of 50 lbs. each	450·00 „		
		3,862 21	
10 Heifers yielded	2,992·99 lbs.	..	299 30
Handicap of 75 lbs. each	750·00 „	3,742 99	
Butter fat return from herd (without herd allowance		11,181 94	
28 Cows in herd allowed 14 lbs. each (the ½ lb allowance per cow)		392 00	
Herd total of Butter fat (including all handicap allowances)		11,578 94	**413·35**

Averages in Detail of the Herds which Averaged Over 300 lbs. Butter Fat per Cow.

Order of Merit.	Owner.	Breed.	Average Yield without any Allowance.						Herd Yield with all handicap allowances.
			Heifers.		2nd Calf.		Mature Cows.		
			No. in Herd.	Average Butter Fat	No. in Herd.	Average Butter Fat.	No. in Herd.	Average Butter Fat.	
				lbs.		lbs.		lbs.	lbs. fat.
1	T. Harvey	Jersey .	3	354·01	1	524·44	7	466·87	471·82
2	A. W. Jones & Son ..	Friesian ..	10	299·30	9	379·13	9	397·42	413·35
3	Finn Bros . ..	Jersey ..	1	286·73	1	358·45	9	401·21	403·78
4	W. Woodmason ..	„ .	15	276·28	3	353·74	26	393·59	401·85
5	G. Lyon .. .	„	6	300·88	3	323·59	7	399·23	393·56
6	J. D. Read . .	„ ..	10	271·19	9	349·16	9	387·49	390·49
7	Lyon & Kerr .	„ .	10	299·54	2	323·00	2	386·87	383·08
8	W. K. Atkinson	Shorthorn .	6	254·81	4	381·36	6	376·61	380·75
9	Mrs. E. M. Lennie ..	Jersey ..	2	322·46	1	387·66	11	360·96	378·66
10	O. J. Syme	Friesian ..	8	254·83	4	356·15	12	370·29	374·78
11	H. Luxton	Jersey ..	6	212·00	8	319·94	4	386·40	364·95
12	C. Bamford . .	Ayrshire ..	12	243·96	6	325·73	8	355·94	356·43
13	C. D. Lloyd . .	Jersey .	3	297·72	2	256·07	9	349·99	355·58
14	A. W. Jones & Son ..	„ ..	11	244·90	3	298·66	8	361·08	349·80
15	J. T. Tweddle ..	Friesian .	7	275·53	5	273·29	..	..	345·18
16	Department of Agriculture	Red Poll ..	14	219·45	6	273·21	20	343·07	343·07
17	Flack & Sewell ..	Friesian ..	16	244·26	7	301·75	15	312·04	341·40
18	E. A. Denis	Jersey ..	5	250·16	3	300·67	9	330·96	341·23
19	Geelong Harbor Trust ..	Ayrshire ..	10	242·32	3	308·33	15	305·72	329·50
20	S. Russell	Friesian ..	4	291·21	2	256·75	7	294·61	325·01
21	Messrs. Kerr Brothers	Shorthorn	7	254·05	..	..	13	312·77	328·47
22	H. S. Gibson	Ayrshire	4	233·68	6	257·41	5	328·03	322·12
23	A. W. Findlay ..	Jersey .	2	276·12	1	275·06	7	300·00	322·07
24	Alston Estate ..	„	4	200·62	3	323·92	6	309·99	320·67
25	A. Joshua . ..	„ .	5	251·04	3	207·60	2	337·80	312·86
26	R. Ralston	Ayrshire	6	227·65	7	252·74	2	310·22	311·87
27	C. Lees	„	5	226·93	7	281·94	10	254·78	301·05
28	F. Bidgood .. .	Jersey ..	2	215·97	2	322·96	9	277·89	301·03

COWS IN ORDER OF MERIT.

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard.

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
1	Ragtime of Warenda	T. Mesley	Jersey	9,186	6·70	615·51	Jessie's Handsome Boy
2	Werribee Starbright 9th	C. D. Lloyd	"	10,297	5·79	596·24	Island Butter King (imp.)
3	Dominion Queen Mercede	Flack and Sewell	Friesian	15,958	3·69	589·53	Woodcrest Jo
4	Czarina of Springhurst	P. J. Maloney	Jersey	11,010	5·30	583·30	Young Defiance
5	Wattle of Springhurst	P. J. Maloney	"	11,614	5·01	582·39	Brighton Cub
6	Keynote	T. Mesley	"	9,513	5·65	537·05	Skim of Dunalister
7	Dominion Hyacinth	Department of Agriculture	Friesian	13,532	3·96	535·98	Oak de Kol 2nd Homestead Fobes
8	May Queen 2nd	A. W. Jones and Son	"	12,587	4·24	534·26	Annette's Prince
9	Graceful Countess of Lesterfield	T. Harvey	Jersey	8,924	5·85	523·31	Handsome Boy 3rd
10	Jubilee 15th	A. W. Jones and Son	"	10,205	5·07	518·21	Navigator
11	Pauline of Ashby	Dickinson Bros.	Friesian	15,149	3·40	514·47	Pearl's Prince of Brundee
12	Tonga	Department of Agriculture	Red Poll	12,306	4·16	512·90	Honingham Archbishop
13	Lady Marge of Jerseyholm	T. Harvey	Jersey	8,056	6·27	505·32	Sweet Fox 2nd
14	Sweet Nell of Hillcrest	Mrs. E. M. Lennie	"	9,767	5·17	504·64	Black Prince of Mt. Crawford
15	Latakia	Department of Agriculture	Red Poll	10,797	4·66	504·08	Nicotine
16	Empress 2nd of Holmwood	T. Harvey	Jersey	9,331	5·38	502·32	Audrey's Lord Twylish
17	Dominion Violet Fobes	Flack and Sewell	Friesian	14,536	3·43	497·91	Woodcrest Jo
18	Silvermine 16th of Banyule	W. and G. Finn	Jersey	8,878	5·59	496·65	Mabel's Chief
19	Stumpy 4th of Holmwood	Mrs. E. M. Lennie	"	9,912	5·01	496·39	Audrey's Lord Twylish
20	Jenny Lind 10th of Melrose	W. Woodmason	"	9,398	5·22	490·74	First Choice of Melrose
21	Jonquil of Springhurst	J. D. Read	"	7,500	6·50	487·62	Attraction of Springhurst
22	Queenie of Ashby	Dickinson Bros.	Friesian	12,604	3·86	486·95	Pearl's Prince of Brundee
23	Lassie Fowler 7th of Melrose	W. Woodmason	Jersey	7,953	6·11	486·27	Handsome Boy 5th of Melrose
24	Dominion Coringa	Department of Agriculture	Friesian	14,334	3·38	484·08	Woodcrest Jo
25	Creamy 3rd of Lesterfield	Gibson Bros.	Jersey	8,300	5·16	482·40	Lesterfield Boy
26	Morven Queenie 8th	Kerr Bros.	Shorthorn	12,124	3·95	478·66	Manor York Rose 1st
27	Babe of Medburn Grove	C. Bamford	Ayrshire	11,921	3·99	475·22	Leo of Gleneira
28	Dominion Segis Fobes	R. Ferguson	Friesian	15,160	3·13	474·14	Woodcrest Jo
29	Bolobek Janet	J. Wills	"	12,927	3·66	473·42	Rhoda Prince of Rubicon
30	Lily 6th of Melrose	A. E. Denis	Jersey	8,132	5·80	471·87	Handsome Boy 3rd of Melrose
31	Nictitana	Department of Agriculture	Red Poll	9,961	4·72	470·40	Nicotine
32	Duplicate Posch Maud	O. J. Syme	Friesian	13,665	3·42	466·75	Duplicate Posch
33	Graceful Duchess 10th of Melrose	W. Woodmason	Jersey	8,009	5·82	466·48	Jessie's 4th Son of Melrose
34	Kirsty 8th of Jerseyholm	T. Harvey	"	8,226	5·66	465·89	Emperor
35	Soprano 2nd of Banyule	C. G. Lyon	"	8,025	5·67	465·37	Mabel's Chief
36	Science of Springhurst	W. and G. Finn	"	8,254	5·64	465·23	Brighton Cub
37	Dominion Violet Fobes	Flack and Sewell	Friesian	13,676	3·40	465·03	Woodcrest Jo
38	Lady Choice of Tarnpirr	W. Tendeson	Jersey	8,088	5·74	464·15	First Choice of Melrose
39	Zillah 2nd	Evans Bros.	Red Poll	10,855	4·25	461·61	Redman
40	Virginia of Springhurst	J. D. Read	Jersey	7,504	6·13	460·12	Haig of Springhurst
41	Quality 8th of Melrose	J. Hunter	"	8,008	5·66	453·22	Handsome Boy 5th of Melrose
42	Bluebell of Warrook	H. J. Munro	Ayrshire	11,157	4·06	452·86	Alice's Jamie of Oakbank
43	Molly 6th of Banyule	C. G. Lyon	Jersey	9,744	4·63	451·21	Audrey's Lord Twylish
44	Silvermine 18th of Banyule	C. G. Lyon	"	8,096	5·55	449·13	Mabel's Chief
45	Goldy of Strathbow	F. Raggatt	"	7,516	5·90	443·33	Mac of Tarnpirr
46	Graceful Duchess 14th of Melrose	W. Woodmason	"	7,586	5·84	442·87	Handsome Boy 5th of Melrose
47	Sunset Star of Dunalister	Leongatha High School	"	8,080	5·47	441·97	Lord Brighton of Dunalister
48	Kirsty 6th of Jerseyholm	T. Harvey	"	7,142	6·18	441·73	Venture's Hero
49	Seaweed of Springhurst	W. and G. Finn	"	8,398	5·26	441·71	Investigator of Melrose
50	Lily of Holly Green	H. L. Webb	Ayrshire	10,504	4·20	441·17	Rex of Oakbank
51	Peerless of Ferntree Vale	Gibson Bros.	Jersey	7,965	5·54	441·01	Linda 2nd's Lad of Kings Vale
52	Brighton Princess of Springhurst	C. Deverell	"	9,138	4·82	440·69	Brighton Cub
53	Her Royal Highness	A. W. Jones and Son	Friesian	14,415	3·06	440·68	Pearl's Prince of Brundee
54	Chevy 8th of Melrose	W. Woodmason	Jersey	7,731	5·68	439·06	Pretty Noble (imp.)

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs		lbs.	
55	Graceful Duchess 19th of Melrose	W. Woodmason ..	Jersey ..	6,800	6·44	438·21	Handsome Boy 5th of Melrose
56	Clelia of Woorayl ..	Leongatha High School	,, ..	8,148	5·37	437·75	Butter Boy
57	Bluebell of Jerseyholm..	T. Harvey ..	,, ..	7,380	5·92	437·20	Venture's Hero
58	Bud 2nd of View Point..	H D. W. Canobio..	Ayrshire	10,492	4·17	437 07	Glen Elgin's Ben
59	Tarrawarra No. 15 ..	J Carter ..	Friesian	9,658	4·52	436·73	Tarrawarra No. 2
60	Roan Daisy 18th ..	W. K. Atkinson ..	Shorthorn	10,098	4·31	436·12	Poplar Vale Prince 9th
61	Graceful Duchess 11th of Melrose	W. Woodmason ..	Jersey ..	6,971	6·21	433·0	Mystery's Son of Melrose
62	Nimitabel of Kameruka	F. Trevaskis ..	,, ..	9,543	4·55	432·51	Silver King
63	St. Albans Gem ..	A. W. Jones and Son	Friesian	12,721	3·31	431·22	Pearl's Prince of Brundee
64	Edith 6th of Melrose ..	W. Woodmason ..	Jersey ..	7,187	5·99	430·44	Handsome Boy 5th of Melrose
65	Daphne 13th	W K. Atkinson ..	Shorthorn	11,792	3·65	430·41	Blakeston Prince 18th
66	Domino's Hengerveld Belle	O J. Syme .	Friesian	11,963	3·60	430·29	King of Dominoes
67	Beauty of Craignell ..	A W. Jones and Son	Friesian	11,999	3·58	428·96	Canterbury Statesman
68	Clover of Sparrovale ..	Geelong Harbour Trust	Ayrshire	8,200	5·22	428·24	Glen Elgin's Rover
69	Cornflower of Springhurst	J. D. Read ..	Jersey ..	7,976	5·37	427 96	Brighton Cub
70	Queen Elizabeth ..	Department of Agriculture	Red Poll	9,621	4·44	427·64	Nicotine
71	Daphne 4th of Ferndale	D C. Miller ..	Jersey ..	7,314	5·83	426 36	Lord Grey
72	Mary Anne of Banyule..	H. Luxton ..	,, ..	8,405	5 07	426·22	Earl Twylish of Kameruka
73	Pansy 7th of Kyora .	F. Bidgood ..	,, ..	8,427	5·03	425·52	Young Defiance
74	Cutty Sark	Department of Agriculture	Red Poll	10,106	4·20	424·11	Belligerent
75	Lady Perfection .	W H. Waycott ..	Jersey ..	7,216	5·88	423·99	Perfection's Lad of Kings Vale
76	Flower 6th of Melrose ..	W. Woodmason ..	,, ..	8,292	5·11	423·65	Royal Blue
77	Gloria of Brookside ..	W. Tendeson .	,, ..	7,059	5·96	420·75	Reynard Twylish
78	Trixie of Ever Green .	H. S. Gibson ..	Ayrshire	8,956	4·79	418·86	General Gordon
79	Trixie 2nd of Linden ..	F. W. Belscher ..	Jersey ..	8,130	5·15	418·69	Defence of Linden
80	Golden Noble Duchess	C D. Lloyd .	,, ..	6,282	6·62	416 09	Golden Fern's Noble
81	Buttercup of Bonshaw	P J. Maloney ..	,, ..	7,429	5·60	415·83	The Pilot of Tarnpirr
82	Lassie 4th of Clover Flat	F. Raggatt .	,, .	8,730	4·76	415·56	Prince Noreen
83	Daffodil	J. H O'Loughlin ..	Red Poll	8,841	4·92	414·77	Cubata
84	Bridesmaid of Clarendonevre	W. and G. Finn ..	Jersey ..	9,026	4·58	413·44	Lotina Larkspur's Twylish
85	Banksia of Springhurst	Mrs. I Beard ..	,, ..	7,728	5·34	413·02	Bulwark
86	Mistletoe 2nd of Tarnpirr	A F. Denis ..	,, ..	7,592	5·42	411·54	First Choice of Melrose
87	May of Clover Flat ..	F. Raggatt .	,, ..	7,683	5·35	411·12	Prince Noreen
88	Avesia	Department of Agriculture	Red Poll	9,833	4·17	410·84	Nicotine
89	Sarah of Glen Alvie ..	G Gange .	Ayrshire	8,391	4·89	410·47	Triumph of Gleneira
90	Primrose 2nd of Melrose	R H. Maher .	Jersey ..	6,994	5·87	410 21	Golden Fern's Viscount (imp.)
91	Beauty 2nd of Bonshaw	P. J Maloney ..	,, ..	7,291	5·61	409·34	Laddie 2nd of Banyule
92	Pansy 4th of Ferntree Vale	Gibson Bros. .	,, ..	7,115	5·73	407·90	Linda 15th's Twylish of Kings Vale
93	Springfield de Kol .	Flack and Sewell ..	Friesian	10,303	3·97	407·52	Rosevale Inka Sylvia Posch
94	Tulip 2nd of Meridale ..	W. and G. Finn ..	Jersey ..	8,244	4·95	407·25	Dinah's Model of Kings Vale
95	Laura 9th of Melrose ..	W Woodmason ..	,, ..	6,715	6·05	406·36	Pretty Noble
96	Quality 8th of Melrose	W Woodmason ..	,, ..	6,591	6·16	406·33	Handsome Boy 5th of Melrose
97	Gingerbread	C. D Lloyd ..	,, ..	7,281	5·58	406·11	Mabel's Chief
98	Escape of Murndal ..	W. and G. Finn ..	,, ..	8,709	4·66	405·87	Canary's Lad 13th
99	Tongala Queenie ..	S Russell ..	Friesian	7,274	5·58	405·79	
100	Woodruff Lady Monda..	H. Luxton ..	Jersey ..	8,074	5·02	404·98	Lord Richmond
101	Thelma of Meryula ..	A. W. Jones and Son	,, ..	8,139	4·97	404·64	Larkspur's Twylish 2nd
102	Beauty of Tarnpirr ..	A W. Jones and Son	,, ..	6,432	6·29	404·53	First Choice of Melrose
103	Holland Lass 2nd of Berry	Flack and Sewell ..	Friesian	11,864	3·41	404·05	Sultan La Polka
104	Marjorie of Langley Park	Callery Bros. ..	Ayrshire	9,836	4·10	403·12	Royalty of Rythdale
105	Vanilla 8th of Melrose ..	A Joshua ..	Jersey ..	7,753	5·17	402·85	Pretty Noble (imp.)
106	Waverly Lass 3rd of Melrose	W. Woodmason ..	,, ..	6,282	6·41	402·61	Handsome Boy 5th of Melrose
107	Molly 2nd of Clover Flat	W. J. Colman ..	,, ..	7,312	5·47	400·17	Maid of the Glen's Golden Carnation
108	Bolobek May	O J Syme ..	Friesian	11,910	3·36	399·81	Indulge Johanna Lad
109	Pearl of Willow Park ..	W. K. Atkinson ..	Shorthorn	10,404	3·82	398·69	Havelock of Darbalara
110	Trixie of Ever Green ..	H S. Gibson ..	Ayrshire	8,770	4·54	398·40	General Gordon
111	Pidgeon of Kameruka ..	Alston Estate ..	Jersey ..	6,585	6·04	397·95	Silver King
112	Blanche Rose 10th ..	W. K. Atkinson ..	Shorthorn	10,617	3·74	397·07	Poplar Vale Prince 9th
113	Jenny Lind 9th of Melrose	W. Woodmason ..	Jersey ..	6,414	6·17	395·91	Pretty Noble (imp.)
114	Mountain Princess of Langley Park	Callery Bros. .	Ayrshire	8,858	4·46	395·48	Bonnie's Chiel of Victoria Bank

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit	Name.	Owner.	Breed	Milk.	Average Test	Butter Fat.	Sire
				lbs.		lbs	
115	Silver Bell of Kameruka	Alston Estate ..	Jersey ..	6,520	6·06	395·41	Silver King
116	Rarity 10th of Melrose	W. Woodmason ..	,, ..	6,346	6·22	394·85	Handsome Boy 5th of Melrose
117	Eidelweiss of Springhurst	J. D. Read ..	,, ..	6,928	5·68	393·84	Fisher
118	Roseleaf of Langley Park	Callery Bros. ..	Ayrshire	8,676	4·54	393·84	Bonnie's Chiel of Victoria Bank
119	Werribee Northwood Madeira 6th	P. Chirnside ..	Jersey .	6,756	5·8[illegible]	393·50	Northwood King
120	Morocco	Department of Agriculture	Red Poll	11,538	3·41	393·42	Ganymede
121	Molly 4th of Banyule ..	C. G Lyon ..	Jersey ..	8,337	4·71	392·84	Starbright's Lord Twylish
122	Daisy 6th of Jerseyholm	T. Harvey ..	,, ..	7,194	5·45	392·31	Emperor
123	Merella 2nd of Yarra Brae	Mrs. E. M Lennie	,, ..	6,652	5·90	392·22	Starbright Renard
124	Blossom 4th of Melrose	W. Woodmason ..	,, ..	7,359	5·31	391·17	Pretty Noble (imp)
125	Shadow of Luscombe ..	Mrs. I Beard ..	,, ..	7,266	5·37	390·36	Skim of Dunalister
126	Nemophila of Springhurst	J. D Read ..	,, ..	6,683	5·83	389·59	Investigator of Melrose
127	Nellie of Craigneil ..	A. W. Jones and Son	Friesian	10,294	3·78	389·54	King Mercena
128	Dominion Proud Lassie	Department of Agriculture	,, ..	11,336	3·42	387·14	Woodcrest Jo
129	Bonnie 2nd of Tarnpirr	A. L. N Walter ..	Jersey ..	5,778	6·70	386·87	Royal Rose's Choice
130	Creamy of Lesterfield ..	W. Fixter ..	,, ..	8,373	4·62	386·66	Lesterfield Boy
131	Collingwood's Beauty ..	Department of Agriculture	,, .	6,015	6·40	384·98	Lady's Fox of Collingwood
132	Mona of Hillcrest .	Leongatha High School	,, ..	9,119	4·22	384·97	Black Prince of Mt Crawford
133	Dunalister Perree's Czarina	Clyne Bros.	,, .	6,165	6·24	384·60	Perree's Duke
134	Ettie 5th of Banyule ..	C G Lyon ..	,, ..	7,925	4·85	384·28	Mabel's Chief (imp.)
135	Fuchsia 13th of Melrose	A W Jones and Son	,, ..	8,264	4·64	383·70	Lady of Melrose 2nd's Noble
136	Pico . ..	Department of Agriculture	Red Poll	9,480	4·04	383·41	Belligerent
137	Dominion Iona .	Flack and Sewell ..	Friesian	12,303	3·11	382·17	Woodcrest Jo
138	Joy of Struan Park ..	D. F. Griffiths .	Ayrshire	8,107	4·71	381·76	General of Gowrie Park
139	Defender's Favourite of Boorene	A. A Broad ..	Jersey ..	7,438	5·13	381·29	Fox's Nonpariel
140	Pearl of Burnbrae .	Sadler Bros. ..	Ayrshire	8,975	4·24	380·68	Brae Lock
141	Namesake 2nd ..	T Mesley .	Jersey .	7,726	4·92	379·95	Verbena's Pride
142	Vanilla 7th of Melrose .	W. Woodmason ..	,, ..	7,171	5·30	379·07	Pretty Noble (imp)
143	Dunalister Perree's Progress	D. Peter .. .	,, ..	6,622	5·71	378·42	Perree's Duke
144	Jessie 20th of Melrose ..	W. Woodmason ..	,, ..	6,087	6·22	378·33	Handsome Boy 5th of Melrose
145	Pearl 5th of Holmwood	H. Luxton ..	,, ..	7,827	4·83	378·23	Audrey's Lord Twylish
146	Noorat Marguerite ..	Mrs A Black .	,, ..	7,654	4·94	377·99	Obelisk
147	St. Albans Lady	A. W Jones and Son	Friesian	9,289	4·07	377·92	Pearl's Prince of Brundee
148	Jenny Lind 13th of Melrose	R H. Maher ..	Jersey ..	6,348	5·95	377·46	Golden Fern's Viscount (imp)
149	Netherlana	Department of Agriculture	Red Poll	9,060	4·16	377·03	Melton Prince
150	Roma of Hillcrest .	A. A. Broad ..	Jersey ..	8,723	4·32	376·53	Bell Boy of Hillcrest
151	Trixie of Medburn Grove	C. Bamford ..	Ayrshire	7,499	5·02	376·44	St. Elfred of Willow Grove
152	Dolly 4th of Glengowrie	J. R. Telford ..	,, ..	8,492	4·42	375·64	Bruce 2nd of Glengowrie
153	Morven Duchess 15th ..	Kerr Bros. ..	Shorthorn	9,811	3·81	374·40	Morven York Rose 10th
154	Hawthorn 5th of Banyule	C G Lyon ..	Jersey ..	7,162	5·22	373·96	Mabel's Chief (imp)
155	Gladness of Struan Park	D. F Griffiths .	Ayrshire	8,475	4·40	372·97	Wallace of Gowrie Park
156	Dominion Cora ..	Flack and Sewell ..	Friesian	10,835	3·44	372·59	Oak de Kol
157	Lily 5th of Holmwood	C. G. Lyon ..	Jersey ..	6,838	5·45	372·39	Audrey's Lord Twylish
158	Dutch Girl 2nd of Berry	Flack and Sewell ..	Friesian	9,920	3·74	371·37	Sultan La Polka
159	Nightshade of Springhurst	J. D. Read ..	Jersey ..	8,095	4·58	371·12	Young Defiance
160	Jessie 12th of Melrose ..	W. Woodmason ..	,, .	6,335	5·86	370·65	Pretty Noble (imp)
161	Dauphine of Springhurst	E. A. Denis ..	,, ..	6,406	5·72	369·97	Investigator of Melrose
162	Queen of Bellaire ..	W. J. Colman ..	,, ..	6,413	5·76	369·31	Fox Trot
163	Tiny of Tarnpirr ..	J. Hunter ..	,, ..	6,235	5·92	369·20	Morocco's Carnation Fox
164	Bolobek Dolly Gray ..	O. J. Syme ..	Friesian	11,071	3·33	368·54	Rhoda Prince of Rubicon
165	Pansie of Medburn Grove	C. Bamford ..	Ayrshire	9,259	3·98	368·43	Leo of Gleneira
166	Jennie de Kol ..	O. J. Syme ..	Friesian	10,571	3·48	368·00	Duplicate Posch
167	Morven Cressida ..	Kerr Bros. ..	Shorthorn	9,000	4·08	367·60	Manor York Rose
168	Marie of Bonshaw ..	P. J. Maloney ..	Jersey ..	8,015	4·58	367·31	Laddie 2nd of Banyule
169	Starleigh's Princess of Clover Flat	W. J. Colman ..	,, ..	7,093	5·17	367·06	Prince Noreen
170	Tongala Doreen ..	S. Russell ..	Friesian	10,249	3·58	366·96	
171	Tulip 5th of Bonshaw ..	Mrs. E. M. Lennie ..	Jersey ..	8,148	4·49	365·95	Laddie 2nd of Banyule
172	Monovale Amethyst Paxton	Flack and Sewell ..	Friesian	8,855	4·13	365·44	Prince Pietje Paxton
173	Starbright of Lynroy ..	Mrs. E. M. Lennie ..	Jersey ..	6,527	5·60	365·36	Island Butter King (imp.
174	Bolobek Anabell ..	O. J. Syme ..	Friesian	9,440	3·87	365·30	Indulge Johanna Lad
175	Postcard of Tarnpirr ..	A. L. N. Walter ..	Jersey ..	5,869	6·21	364·29	First Choice of Melrose

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

Order of Merit.	Name	Owner	Breed	Milk	Average Test	Butter Fat	Sire.
				lbs.		lbs.	
176	Beauty's Daffodil of Lesterfield	W. Fixter ..	Jersey .	7,663	4·75	363·97	Lesterfield Handsome Boy
177	Werribee Starbright 8th	P. Chirnside .	,, ..	7,704	4·72	363·75	Island Butter King (imp.)
178	Daisy Bell of Retreat ..	W. J. Muhlebach .	Ayrshire	8,557	4·26	363·62	Musician of Willow Vale
179	Laura 12th of Melrose	R. H. Maher ..	Jersey ..	6,174	5·88	362·83	Golden Fern's Viscount
180	Morven Pansy 7th	Kerr Bros. ..	Shorthorn	8,978	4·04	362·76	Manor York Rose 1st
181	Bolobek Rhoda ..	O. J. Syme .	Friesian	11,179	3·24	362·55	Rhoda Prince of Rubicon
182	Sweet Pansy 5th of Melrose	G. Rowe .	Jersey ..	5,401	6·71	362·[illegible]	Handsome Boy 5th of Melrose
183	Golden Fern of Glen Iris	C. D. Lloyd .	,, ..	5,991	6·05	362·38	Mabel's Chief (imp.)
184	Tarrawarra No. 16 .	J. Carter .	Friesian	8,562	4·21	360·73	Tarrawarra No. 3
185	Golden Fern of Glen Iris	C. D. Lloyd .	Jersey ..	5,919	6·09	360·59	Mabel's Chief (imp.)
186	Blanchotte 3rd .	A. W. Jones and Son	,, ..	6,515	5·52	359·61	Garantie's Antimony
187	Bolobek Isabella	O. J. Syme	Friesian	11,754	3·06	359·31	Indulge Johanna Lad
188	Vanilla 5th of Melrose ..	W. Woodmason .	Jersey ..	8,831	4·07	359·29	Wild Rover
189	Rarity 7th of Melrose .	W. Woodmason	,, .	7,510	4·76	357·61	Mystery's Son of Melrose
190	Holly Queen of Pentland 4th	F. G. Sadler .	Shorthorn	9,008	3·96	356·31	13th Duke of Woodlands
191	Petunia of Glencairn ..	N. Gange .	Ayrshire	8,998	3·96	355·88	Peacemaker of Glencairn
192	Rosebud of Tarnpirr .	A. L. N. Walter .	Jersey ..	6,228	5·71	355·87	Morocco's Carnation Fox
193	Primrose 2nd of Tarnpirr	Mrs. E. M. Lennie	,, ..	6,052	5·88	355·71	First Choice of Melrose
194	Phyllis of Ashby ..	Dickinson Bros	Friesian	10,869	3·26	355·12	Pearl's Prince of Brundee
195	Clover of Springhurst	J. D. Read	Jersey ..	6,640	5·34	354·62	Brighton Cub
196	Silvermine 20th of Banyule	C. G. Lyon .	,, ..	6,232	5·67	354·54	Mabel's Chief (imp.)
197	Jessie 11th of Ferntree Vale	J. Phillips .	,, ..	8,486	4·18	354·23	Starbright Renard
198	Lassie Fowler 8th of Melrose	R. H. Maher .	,, .	5,730	6·18	354·16	Golden Fern's Viscount (imp.)
199	Noorat Grey Girl	Mrs. A. Black	,, .	7,036	5·03	353·68	Obelisk
200	Maggie of Ashby	Dickinson Bros .	Friesian	10,197	3·47	353·11	Pearl's Prince of Brundee
201	Bountiful of La Motte .	S. A. Johnson .	Ayrshire	8,119	4·34	352·42	Lochinvar of Prior Park
202	Barbara of Seafield	J. Benallack	,,	7,261	4·85	352·15	Dunoon of Seafield
203	Maisie of Sparrovale	Geelong Harbour Trust	,, .	7,99[illegible]	4·39	351·03	Stuart of Gowrie Park
204	Jubilee Daffodil .	Miss B. Reid .	Jersey ..	7,326	4·78	350·39	Jubilee May 2nd's Prince
205	Chevy 12th of Melrose	J. Hunter .	,, .	5,635	6·22	350·32	Handsome Boy 5th of Melrose
206	Welcome of Tarnpirr .	Alston Estate .	,,	5,428	6·54	350·20	First Choice of Melrose
207	Mountain Mist of Kameruka	Miss B. Reid	,,	6,[illegible]03	3·50	349·96	Jubilee May 2nd's Prince
208	May of Sparrovale .	Geelong Harbour Trust	Ayrshire	8,439	4·14	340·77	Scottish King of Gowrie Park
209	Adora of Fernhill	J. R. Telford ..	,, .	8,258	4·22	348·58	Glen Elgin's Ian
210	Jessie 21st of Melrose	W. Woodmason	Jersey .	5,977	5·83	348·33	Handsome Boy 5th of Melrose
211	Foxglove 2nd of Tarnpirr	W. and G. Finn ..	,, .	5,940	5·84	346·85	First Choice of Melrose
212	Bolobek Rose .	A. W. Jones and Son	Friesian	9,840	3·54	346·20	Colantha Ponteac
213	Pride of Wattle Bank ..	A. Kirby	Ayrshire	7,819	4·42	345·58	Brownie of Gowrie Park
214	Fancy Queen of Ferndale	D. C. Miller .	Jersey .	7,219	4·78	345·15	Lord Grey
215	Bolobek Amy	O. J. Syme .	Friesian	9,587	3·59	341·42	Rhoda Prince of Rubicon
216	Fay of Banyule .	H. Perdriau .	Ayrshire	8,765	3·93	344.36	Rational of Oakbank
217	Guinea Gold of Brookside	W. Tendeson	Jersey .	7,650	4·48	343·01	Renard's Twylish
218	Werribee Northwood Attraction	A. W. Findlay .	,,	6,235	5·48	341·49	Northwood King
219	Dunalister Perree's Tissue	D. Peter . .	,,	5,357	6·36	340·92	Perree's Duke
220	Jessie 15th of Melrose	W. Woodmason	,,	5,810	5·86	340·26	Pretty Noble (imp.)
221	Ontario . .	Department of Agriculture	Red Poll	8,807	3·86	340·06	Acton Dewstone (imp.)
222	Nestle of Gleneira	C. Lees	Ayrshire	7,518	4·51	339·24	Triumph of Gleneira
223	Surprise of Woorayl	Leongatha High School	Jersey .	5,598	6·06	339·20	Prince's Glory
224	Beauty of Bonshaw .	Mrs. E. M. Lennie.	,, .	6,466	5·24	339·05	Laddie 2nd of Banyule
225	Annie G. of Tarnpirr .	Alston Estate .	,,	5,889	5·75	338·84	First Choice of Melrose
226	Phoebe of Ashby	Dickinson Bros ..	Friesian	9,852	3·44	338·46	Pearl's Prince of Brundee
227	Starlight of Wethersdane	C. Bamford .	Ayrshire	9,229	3·66	337·91	Glen Elgin's Combine
228	Dominion Belle Corona	Department of Agriculture	Friesian	10,518	3·21	337·75	Oak de Kol Homestead Fobes
229	Peerless 20th of Melrose	R. H. Maher ..	Jersey ..	6,130	5·49	336·24	Golden Fern's Viscount (imp.)
230	Letetia 2nd of Somerville	H. Luxton	,, .	6,534	5·15	336·19	Annette 2nd's Twylish
231	Valda's Queen of Somerville	W. and G. Finn ..	,, .	7,364	4·56	336·07	Rochdale King
232	Beauty of Medburn Grove	C. Bamford	Ayrshire	7,727	4·33	335·22	St. Elfred of Willow Vale
233	Mystery 14th's Beauty of Lesterfield	A. W. Findlay .	Jersey .	6,407	5·23	325·09	Magnets Maitland

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit	Name	Owner.	Breed.	Milk	Average Test	Butter Fat.	Sire.
				lbs.		lbs	
234	Philomel	T. Mesley	Jersey	6,646	5·02	334·55	Falcon
235	Cora 2nd of Havilah	J. Scott	"	6,662	5·02	334·26	Silver Belle's Golden Lad
236	Rarity 11th of Melrose	J. Hunter	"	5,964	5·60	334 01	Handsome Boy 5th of Melrose
237	Fuchsia 12th of Melrose	C J. Reid	"	6,868	4 86	333·85	Pearl's Son of Melrose
238	Maitland's Petal 3rd of Havilah	J. Scott	"	6,319	5·26	332·65	Silver Belle's Golden Lad
239	Lupin of Medburn Grove	C. Bamford	Ayrshire	8,536	3·89	332 10	St. Elfred of Willow Vale
240	Bolobek Jean	O. J Syme	Friesian	9.539	3·48	331 68	Indulge Johanna Lad
241	Fox's Clementine 2nd	F. Bidgood	Jersey	6,058	5·45	330·17	Carnation's Fox
242	Lady 2nd of Bonshaw	F. Trevaskis	"	6,829	4·68	329·91	Laddie 2nd of Banyule
243	Vanilla 11th of Melrose	W. Woodmason	"	5,599	5·87	328·91	Handsome Boy 5th of Melrose
244	Jessie 22nd of Melrose	W. Woodmason	"	5,288	6·20	327·93	Handsome Boy 5th of Melrose
245	Garenne 3rd of Warenda	Mrs. I Beard	"	5,890	5·57	327·81	Skim of Dunalister
246	Linda 2nd of Bonshaw	Mrs E M Lennie	"	6,771	4·83	327·68	Laddie 2nd of Banyule
247	Noorat Beauty	Mrs. A. Black	"	7,232	4·53	327 42	Obelisk
248	Princess of Grangelea	A. A. Broad	"	6,344	5·15	326 95	Kalimna's Fox
249	Melba	A. W Jones and Son	Friesian	9,348	3 49	326 17	Pearl's Prince of Brundee
250	Little Queen	P. H. Lawrence	Jersey	6,160	5 28	325·46	Foxy Boy
251	Pearl 3rd of Holmwood	Lyon and Kerr	"	6,330	5·11	324·61	Audrey's Lord Twylish
252	Tongala Betty	S Russell	Friesian	7,711	4·21	324·35	
253	Lenora Canary	Flack and Sewell	"	8,086	4·01	324·07	Sir Canary Pietje
254	Marie of Tarnpirr	E A. Denis	Jersey	5,437	5·96	324 03	First Choice of Melrose
255	Pearl of Friesland Park	O. J. Syme	Friesian	9,183	3·58	323 85	King of Dominoes
256	Annetta of View Point	H. D. W Canobio	Ayrshire	8,252	3 92	323·80	Jimmie of View Point
257	Princess Ena	O. J. Syme	Friesian	9,470	3·41	322·99	Duplicate Posch
258	Treasure of Ben Kell	R. Ralston	Ayrshire	7,749	4·16	322·49	Girvan of Oakbank
259	Snowdrift of Gleneira	C. Lees	"	7,712	4·18	322 13	Triumph of Gleneira
260	Flower 13th of Melrose	E. A. Denis	Jersey	4,845	6·59	319 38	Handsome Boy 5th of Melrose
261	Belle of Sparrovale	Geelong Harbour Trust	Ayrshire	6,903	4·63	318·97	Stuart of Gowrie Park
262	Gladsome of Medburn Grove	C. Bamford	"	7,835	4·07	318 78	Leo of Gleneira
263	Pendant	Warragul High School	Red Poll	8,310	3 83	318·26	Longford Major (imp.)
264	Ida Isaacs of Tregorland	J. F. Tuckey	Ayrshire	6,582	4·83	318 12	Isaac of Balvormie
265	Royal Heath of Gowrie Park	D. F. Griffiths	"	8,914	3·56	317·74	Dr. Cranwell of Gowrie Park
266	Primrose of Sparrovale	Geelong Harbour Trust	"	6,868	4·62	317·42	Scottish King of Gowrie Park
267	Jessie 16th of Melrose	Miss L Robinson	Jersey	5,543	5·73	316 38	Handsome Boy 3rd of Melrose
268	Peeress 2nd of Flinders	McFarlane Bros.	Ayrshire	7,333	4 31	315·83	Rab of Oakbank
269	Dominion Homestead Maggie	Flack and Sewell	Friesian	9,744	3·24	315·67	Longbeach Primrose League
270	Morven Duchess 14th	Kerr Bros.	Shorthorn	8,766	3·60	315·47	Charming Duke
271	Oatlands Polly	J Thorburn	Ayrshire	7,113	4·42	314 71	Captain Tasman
272	Birdseye	Department of Agriculture	Red Poll	6,357	4·95	314·55	Tabacum
273	Flashlight	Mrs. A. Black	Jersey	5,734	5·48	314·29	Golden Plum
274	Nancy 4th	Evans Bros.	Red Poll	8,656	3·63	313·84	Battery
275	Queenie of Willow Park	W. K. Atkinson	Shorthorn	7,774	4·03	313·38	Havelock of Darbalara
276	Lotina's Twylish of Roseneath	D. C. Miller	Jersey	6,247	5 01	313·12	Lotina's Noble of Oaklands
277	Dutch Girl of Berry	Flack and Sewell	Friesian	9,033	3·46	312 56	Duke of Amsterdam
278	Lillian of Willow Vale	W. Meredith	Ayrshire	7,287	4 28	311·75	Tarbolton of Oakbank
279	Bonnie of Glencairn	J. H Rogers	"	8,567	3·64	311·48	Zero of Rythdale
280	Violet's Queen of Dunachton	R. Hall	"	8,822	3·74	311·16	Alpha of Oakvale
281	Countess of Byrnside	J. R. Telford	"	7,471	4·16	310·90	Gleneira's Imperial
282	Silvermine of Inverleigh	A. H. Schier	"	7,316	4·24	310·23	Marker of Balvormie
283	Marguerite of Glengowrie	A. H. Schier	"	6,670	4 65	310·12	Orpheus of Glengowrie
284	Daffodil	T H. Payne	Red Poll	6,570	4 72	309·95	Cubata
285	Thelma of View Point	Sadler Bros.	Ayrshire	7,083	3·88	309 76	Jimmie of View Point
286	Pentland's 16th Jessamine	S. H. Ebery	Shorthorn	6,976	4 42	308 22	43rd Earl of Pentland
287	Myrtle 2nd of Pine Grove	A. H. Schier	Ayrshire	7,513	4 10	307·99	Glen Keith of Pine Grove
288	Pearl of Ben Kell	R. Ralston	"	7,658	4·02	307·96	Melville Duke
289	Beauty of Quarry Hills	H. Perdriau	"	6,124	5·02	307·46	Jimmie of View Point
290	Blossom of Sparrovale	Geelong Harbour Trust	"	6,840	4·34	306·91	Stuart of Gowrie Park
291	Victoria Red Rose	Department of Agriculture	Red Poll	7,437	4·12	306·50	Red David

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
292	Belladonna of Springhurst	J. D. Read	Jersey	6,724	4 55	306 26	Attraction of Springhurst
293	Gingercake of Glen Iris	P. Chirnside	,,	5,296	5·77	305·70	Brown Chief
294	Butter Queen of Staghorn	F. Bidgood	,,	5,851	5·22	305·67	Island Butter King (imp.)
295	Lady Elector 2nd of Melrose	W. Woodmason	,,	5,144	5·93	305·23	Pretty Noble (imp)
296	Jubilee Red Rose	Miss B. Reid	,,	5,807	5 25	304 78	Twylish's Maderia's Fox 2nd of Werribee
297	Keepsake of Tarnpirr	E. A. Denis	,,	6,265	4·86	304·35	First Choice of Melrose
298	Red Madge of Gleneira	C. Bamford	Ayrshire	7,124	4·26	303 45	Eclipse of Gleneira
299	Doris of Glencourt	H. J. Munro	,,	7,192	4 22	303·18	Linguist of Oakbank
300	Norah's Pearl	A W. Jones and Son	Friesian	9,347	3·23	301·79	Pearl's Prince of Brundee
301	Jean of Glengowrie	A. H. Schier	Ayrshire	7,940	3·80	301·53	Ada's Jamie of Glengowrie
302	Fox's Golden Cream	P. Chirnside	Jersey	6,296	4·78	301·26	Carnation Fox
303	Hope 5th	C. Falkenberg	,,	5,653	5·31	299·98	Twylish's Pride
304	Maud 2nd of Holly Green	J G Lobb	Ayrshire	6,485	4 62	299 87	Brevet of Oakbank
305	Flower of Sparrovale	Geelong Harbour Trust	,,	6,457	4·65	299·82	Glen Elgin's Rover
306	Gladness 2nd of Struan Park	D F. Griffiths	,,	7,399	4 05	299 38	Bonnie Prince of Gowrie Park
307	Hookah	Department of Agriculture	Red Poll	7,474	3·99	298·54	Longford Major (imp)
308	Cora 2nd of Havilah	J. Scott	Jersey	6,082	4 91	298 48	Silver Belle's Golden Lad
309	Morven Pansy 8th	Kerr Bros.	Shorthorn	7,471	3.99	298·41	Charming Duke 67th
310	Creamy 2nd of Holmwood	Miss L. Robinson	Jersey	6,423	4·66	298·24	Pearl's Prince of Holmwood
311	Morven Lizzie 10th	Kerr Bros.	Shorthorn	8,128	3 67	298·17	Morven York Rose 10th
312	Daisy of Sparrovale	Geelong Harbour Trust	Ayrshire	6,556	4·55	298·00	Scottish King of Gowrie Park
313	Curiosity of Holmwood	W. and G. Finn	Jersey	5,551	5·37	297 84	Pearl's Prince of Holmwood
314	Kestral of Tregorland	J F. Tuckey	Ayrshire	7,102	4 19	297 33	Havelock of Gowrie Park
315	Dinah of Mapleton	G A. Kent	,,	7,158	4 15	297·07	Hero of Rythdale
316	Milkmaid of Holly Green	H. L. Webb	Ayrshire	7,959	3 73	297·02	Marana of Fernhill
317	Maitlands Duchess of Lesterfield	A. W. Findlay	Jersey	6,847	4 34	296·98	Magnet's Maitland
318	Trefoil of Springhurst	J. D Read	,,	5,405	5·48	296 35	Young Defiance
319	Orinoco	Warragul High School	Red Poll	7,410	4·00	296 34	Honingham Alake (imp)
320	Vanity of Warrook	Cockbill and Gibbs	Ayrshire	7,419	3·98	295·78	Alice's Jamie of Oakbank
321	Lady Em of Ever Green	H S. Gibson	,,	7,592	3 89	295·42	General Gordon
322	St. Albans Lily	S. Russell	Friesian	8,817	3 33	295 01	Burdett's Prince
323	Tarrawarra No 7	J. Carter	,,	7,719	3 82	294·98	Tarrawarra No 2
324	Doris of Glencourt	H. J. Munro	Ayrshire	7,066	4·17	294·35	Linguist of Oakbank
325	Meadow Sweet of Sparrovale	Geelong Harbour Trust	,,	6,684	4 40	294 19	Jock of Sparrovale
326	Daisy of Bundara	J H. Rogers	,,	6,919	4 25	294 00	Brown Prince of Bundara
327	Jessie's Pride of Bundara	H. W D Canobio	,,	8,038	3·66	293·98	Isabel's Pride of Gleneira
328	Idea of Tregorland	J F. Tuckey	,,	6,248	4 70	293·91	Havelock of Gowrie Park
329	Dahlia of Retreat	M. Galbraith	,,	6,390	4 60	293·68	Anthony of Gleneira
330	Sadie of Burnside	J. H. Rogers	,,	8,149	3·60	293 57	Zero of Rythdale
331	Pansy of Colac	C. Falkenberg	Jersey	6,696	4 38	293 56	Handsome Progress
332	Leila of Warrook	Cockbill and Gibbs	Ayrshire	6,435	4·55	293 04	Minerva's Jamie of Warrook
333	Princess Thyra 4th of Strachan	W C Cayley	,,	8,250	3·55	292·92	Jamie of Strachan
334	Alice of Woorayl	Leongatha High School	Jersey	4,895	5·98	292·53	Noble Empire
335	Mona's Pearl	Mrs A. Black	,,	6,063	4·82	292·27	Prince Nita
336	Duchess of Ever Green	H S Gibson	Ayrshire	7,620	3·83	291·89	General Gordon
337	Maitlands Floss	A. W Findlay	Jersey	5,816	5 00	291·83	Magnet's Maitland
338	Gingerbread of Glen Iris	C. D. Lloyd	,,	5,323	5·48	291·57	Mabel's Chief
339	Jubilee of Somerset	A. E. Batson	,,	5,010	5·81	291·09	Discoverer
340	Marie of Tarnpirr	Mrs E Sims	,,	4,875	5·95	290·19	First Choice of Melrose
341	Flora of Sparrovale	Geelong Harbour Trust	Ayrshire	6,271	4 62	289·77	Scottish King of Gowrie Park
342	Tongala Maggie	S. Russell	Friesian	7,256	3·99	289·77	
343	Peerless 18th of Melrose	W. Woodmason	Jersey	5,622	5 15	289·67	Golden Fern's Viscount (imp
344	Morven Lizzie 7th	Kerr Bros.	Shorthorn	7,204	4·02	289·67	Manor York Rose
345	My Hope of Kameruka	A. E. Denis	Jersey	6,206	4·67	289·66	Twylish's Pride
346	Kyora Merry Mike's Mayflower	Miss L. Robinson	,,	5,813	4·98	289·20	Merry Mike
347	Daisy of Bignold	F. W. Beischer	,,	6,151	4·69	288·73	Beauty 3rd's Fox
348	Heather of Struan Park	D. F. Griffiths	Ayrshire	6,305	4·57	288·13	Bonnie Prince of Gowrie Park
349	Silvermine of Brookside	W. Tendeson	Jersey	5,439	5·29	287·56	Renard Twylish
350	Idyll's Ideal	Alston Estate	,,	5,945	4·84	287·48	Starbright's 5th Twylish
351	Tulip 4th of Bonshaw	Mrs. E. M. Lennie	,,	5.875	4·89	287·47	The Pilot of Tarnpirr
352	Lilac of Tarnpirr	A. W Jones and Son	,,	5,970	4·81	287·37	Ilford

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit	Name	Owner	Breed	Milk.	Average Test	Butter Fat	Sire.
				lbs		lbs.	
353	Royal Sun Ray	A E Denis	Jersey	6,427	4 47	287·05	Peerless Lord Twylish
354	Cowslip of Devon Park	J. W. Cochrane	Ayrshire	5,919	4·84	286·88	Sultan of Devon Park
355	Jessie of Willowvale	W. J. McKernan	,,	6,082	4·71	286·16	Tarbolton of Oakbank
356	Ada of Rythdale Park	J. W. Cochrane	,,	7,299	3·91	285·65	Leonard of Rythdale Park
357	La Charme	T. Mesley	Jersey	5,214	5·47	285·34	Skim of Dunalister
358	Cherry 5th	W. K. Atkinson	Shorthorn	7,608	3·73	284·02	White Clinker
359	Gratis	T. H. Payne	Red Poll	6,799	4·17	283·80	Acton Ajax (imp.)
360	Flossie of Kelburn	A Robertson	Jersey	4,548	6·22	282·92	Lesterfield Boy
361	Bercham of Berry	Flack and Sewell	Friesian	8,900	3·17	282·53	Obbee 2nd
362	Beryl of Gleneira	McFarlane Bros.	Ayrshire	6,596	4·28	282·27	Majestic of Oakbank
363	Annette 6th of King's Vale	A W. Findlay	Jersey	5,501	5·13	282·23	Carnation's Fancy Northwood King
364	Werribee Northern Larkspur 3rd	A. W. Findlay	,,	4,998	5·64	282·07	Island Butter King (imp.)
365	Lady Marge of Ferndale	A E. Batson	,,	5,183	5·44	281·80	May's Larkspur's Lord Twylish
366	Annette 2nd of King's Vale	F. W Beischer	,,	5,730	4·91	281·35	Victim's Defiance
367	Rachel of Gowrie Park	D. F. Griffiths	Ayrshire	7,065	3·97	280·92	Wallace of Gowrie Park
368	Lucy of Staghorn	F. Bidgood	Jersey	6,001	4·68	280·75	Favourite's Noble
369	Geranium of Langley Park	Callery Bros.	Ayrshire	6,617	4·24	280·52	Bonnie's Chief of Victoria Bank
370	Beatrice of Sparrovale	Geelong Harbour Trust	,,	7,188	3·90	280·11	Stuart of Gowrie Park
371	Harp	Lyon and Kerr	Jersey	5,234	5·35	279·90	Noble Lord (imp.)
372	Morven Queenie 10th	Kerr Bros.	Shorthorn	7,291	3·83	279·13	Charming Duke 27th
373	Ryebread of Glen Iris	C D Lloyd	Jersey	5,480	5·09	278·80	Mabel's Chief
374	Boronia 2nd of Pine Grove	A H Schier	Ayrshire	5,727	4·86	278·52	Glen Keith of Pine Grove
375	Lily 5th of Belwell	G Vallence	,,	6,857	4·05	277·90	Solway of Seafield
376	Queen Bee of Hill View	Mrs C O'Donoghue	,,	6,405	4·34	277·72	Majestic of Drayton
377	Rosena 3rd	S T Algie	Shorthorn	7,064	3·93	277·72	43rd Earl of Pentland
378	Laranago	Warragul High School	Red Poll	6,620	4·19	277·71	Nicotine
379	Tulip of Medburn Grove	W. T Cullen	Ayrshire	7,615	3·64	277·64	St. Elfred of Willow Vale
380	Myrtle of Sparrovale	Geelong Harbour Trust	,,	5,881	4·72	277·03	Scottish Chief of Sparrovale
381	Dolichos of Springhurst	R J. Henry	Jersey	5,995	4·63	277·47	Brighton Cub
382	Fairlie of Brunbrae	Sadler Bros.	Ayrshire	6,342	4·37	276·90	Brae Loch
383	Primrose 2nd of Bonshaw	Mrs E M. Lennie	Jersey	5,099	5·43	276·88	The Pilot of Tarnpirr
384	Narcissa of Blackwood Park	H I. Webb	Ayrshire	6,730	4·11	276·85	Sportsman of Willow Vale
385	Ida Brown of Balvormie	J F Tuckey	,,	6,274	4·41	276·74	Ada's Raglan of Balvormie
386	Belle A	R Faragher	Jersey	4,688	5·90	276·41	Bell Boy of Hillcrest
387	Lady Gray 6th of St. Albans	A E. Batson	,,	4,656	5·93	276·26	Black Fox of St. Albans
388	Edith of Golden Vein	W McIvor	Ayrshire	5,458	5·06	276·23	Sergeant of Golden Vein
389	Purest of Roxburgh	T Douglas	,,	6,887	4·00	275·64	Glen Elgin's Grand Duke
390	Mauve Lilac of Kameruka	Miss B. Reid	Jersey	4,757	5·79	275·54	Ironmaster (imp.)
391	Irene of Banyule	W C Cayley	Ayrshire	6,888	4·00	275·51	Duke of Chatsworth
392	Laurie 2nd of Roseneath	W J. Colman	Jersey	4,990	5·52	275·21	Dunalister's Noble
393	Dot 3rd of Belwell	G Vallence	Ayrshire	7,407	3·70	274·30	Solway of Seafield
394	Melba of Sparrovale	Geelong Harbour Trust	,,	6,366	4·30	273·84	Scottish King of Gowrie Park
395	Snowflake of Rythdale	Callery Bros.	,,	6,931	3·95	273·40	Isabel's Prince of Gleneira
396	Marigold of Retreat	M. Galbraith	,,	6,148	4·44	273·04	Anthony of Gleneira
397	Morven Ruby	Kerr Bros.	Shorthorn	7,359	3·71	272·77	Manor York Rose
398	Glenida	A Joshua	Jersey	5,797	4·71	272·76	Southern King 2nd
399	Bonnie Jean of Langley Park	Callery Bros.	Ayrshire	5,927	4·58	272·75	Bonnie's Chief of Victoria Bank
400	Laurel of Burnbrae	Sadler Bros.	,,	6,954	3·92	272·67	Adam of Coolangatta
401	Annetta of View Point	H. W. D. Canobio	,,	7,146	3·81	272·46	Jimmie of View Point
402	Violet of Retreat	W. Meredith	,,	6,960	3·90	271·78	Musician of Willow Vale
403	Ella of Ellerslie	J. Rogers	,,	7,083	3·83	271·18	Hero of Rythdale
404	Duchess of Sparrovale	Geelong Harbour Trust	,,	7,184	3·77	270·94	Stuart of Gowrie Park
405	Trixie of Colac	C Falkenberg	Jersey	4,867	5·56	270·83	Handsome Progress
406	Gladiana of La Trobe	Sale High School	Ayrshire	5,618	4·81	270·41	Darnley of Gowrie Park
407	Maitland's Canary of Lesterfield	A. W. Findlay	Jersey	5,023	5·38	270·32	Magnet's Maitland
408	Rosella 2nd of King's Vale	S. Earle	,,	5,030	5·37	270·02	Canary's Lad 8th
409	Tongala Pauline	S. Russell	Friesian	7,058	3·82	269·95	
410	Alma of Langley Park	Callery Bros.	Ayrshire	7,155	3·75	269·55	Bonnie's Chief of Victoria Bank
411	Dime of Riccarton	W. T. Cullen	,,	5,422	4·96	269·15	White Prince of Gleneira
412	Doey of Riccarton	W. T. Cullen	,,	7,111	3·78	269·12	White Prince of Gleneira

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit	Name.	Owner.	Breed.	Milk	Average Test	Butter Fat.	Sire
				lbs		lbs.	
413	Red Pet	F. G. Sadler	Shorthorn	6,443	4·18	269·12	Royal Heir 7th
414	Chrissy 2nd of Rathlyn	M. Galbraith	Ayrshire	5,824	4·60	267·71	Anither of Oakbank
415	Gladys of Ellerslie	Sale High School	,,	5,979	4·47	267·56	Young Field Marshal
416	Greta of Hill View	Mrs. C O'Donoghue	,,	6,506	4·09	266·03	Majestic of Drayton
417	Toronto	Department of Agriculture	Red Poll	6,160	4·32	265·97	Belligerent
418	Cutty	Department of Agriculture	,,	5,910	4·50	265·90	Nicotine
419	Lady Gray 8th of St. Albans	A W Jones and Son	Jersey	5,917	4·49	265·82	Navigator
420	Sunny 2nd of Gleneira	C. Lees	Ayrshire	5,685	4·67	265.44	Prince Kyle of Gleneira
421	Lady G. of Banyule	H. Perdriau	,,	6,592	4·02	265·08	Scotty of Numba
422	Lady Grey 1st of St Albans	A. W Jones and Son	Jersey	4,353	6·08	264·80	Garanties Antimony
423	White Stockings 4th	C D. Lloyd	,,	5,986	4·42	264·73	Cowslip's Golden Noble
424	Goodness of Roxburgh	J. A Lang	Ayrshire	6,697	3·95	264·38	Glen Elgin's Grand Duke
425	Kyora Defender May 3rd	Miss L Robinson	Jersey	4,513	5·83	262·96	Lotinas' Defender of Kyora
426	Primrose of Wethersdane	H. D W. Canobio	Ayrshire	6,600	3·98	262·79	His Majesty of Wethersdane
427	Colia of Burnbrae	Sadler Bros	,,	6,518	4·02	262·23	Braeloch
428	Greta of Burnbrae	Sadler Bros	,,	6,725	3·90	262·17	Laura's Laird of Gowrie Park
429	Boronia of Retreat	W. T. Cullen	,,	6,558	3·99	261·98	Anthony of Gleneira
430	Sylvia of Burnside	Cockbill and Gibbs	,,	6,988	3·74	261·41	Ventry of Seafield
431	Nora of Gowrie Park	D. F. Griffiths	,,	6,166	4·24	261·41	Wallace of Gowrie Park
432	Rye Bread of Glen Iris	C D. Lloyd	Jersey	5,150	5·06	260·61	Mabel's Chief
433	Lizzie 2nd of Warrook	W Henderson	Ayrshire	6,335	4·11	260·39	Future's Conservative
434	Bramble	Department of Agriculture	Red Poll	7,153	3·63	259·90	Belligerent
435	Snowberry of Warradale	C. Lees	Ayrshire	6,277	4·13	259·38	Paddy of Warradale
436	Nannie 2nd of Burnside	Cockbill and Gibbs	,,	6,607	3·93	259·35	Zero of Rythdale
437	Pacifica	Department of Agriculture	Red Poll	7,427	3·49	259·34	Acton Dewstone (imp.)
438	Phyllis of Hillcrest	Mrs. E. M. Lennie	Jersey	5,920	4·38	259·25	Black Prince of Mt Crawford
439	Larkspur 2nd	Evans Bros.	Red Poll	6,478	4·00	259·21	Redman
440	Perree's of St. Albans	T. R. Findlay	Jersey	4,925	5·25	258·37	Sweet Fox 2nd of St Albans
441	Golden Betty	Miss L Robinson	,,	6,054	4·26	257·98	Lotina Larkspur Twylish
442	Bessie of Roxburgh	W. T. Cullen	Ayrshire	6,144	4·20	257·74	Gallant Duke of Roxburgh
443	Rose Royal of Langley Park	Callery Bros	,,	6,473	3·82	257·19	Royalty of Rythdale
444	Princess of Colac	C. Falkenberg	Jersey	5,259	4·88	256·77	Irrewarra Duke
445	Countess of Ashby	G A Waite	Friesian	7,792	3·29	256·26	Pearl's Prince of Bruudee
446	Sheila 5th	Mrs. A. Black	Jersey	5,209	4·92	256·24	Rufus
447	Anthem (imp.)	Miss L. Robinson	,,	5,221	4·90	256·12	Bright Prince
448	Fashion of Warrook	Cockbill and Gibbs	Ayrshire	5,684	4·49	255·96	Minerva's Jamie of Warrook
449	Bolobek Joan	J. Wills	Friesian	8,502	3·01	255·83	Indulge Johanna Lad
450	Elsa of Willow Vale	W. Meredith	Ayrshire	5,268	4·85	255·75	Tarbolton of Oakbank
451	Greatness of Roxburgh	T. Douglas	,,	6,343	4·03	255·69	Glen Elgin's Grand Duke
452	Ada of Wattlebank	A. Kirby	,,	5,731	4·45	255·11	Brownie of Gowrie Park
453	Violet 4th	Evans Bros	Red Poll	6,544	3·90	255·03	Bolcum
454	Graceful of Roxburgh	T. Douglas	Ayrshire	5,114	4·98	254·89	Jock of Roxburgh
455	Kipsie of Tregorland	J. F. Tuckey	,,	5,957	4·28	254·76	Havelock of Gowrie Park
456	Scotia	Mrs M. E. Carroll	Red Poll	7,080	3·59	254·28	Nicotine
457	Tilly Lantry 2nd of Waronda	P. H. Lawrence	Jersey	4,454	5·71	254·26	Jessie's Handsome Boy
458	Nellie of La Trobe	Sale High School	Ayrshire	6,010	4·23	254·20	Adella's Jamie of Raith
459	Chance	T. H. Payne	Red Poll	6,323	4·01	233·65	Honingham Alake 3rd (imp.)
460	Peggy 3rd of Summerhill	C. G. Newton	Ayrshire	6,191	4·01	253·16	Anither of Golden Vein
461	Rosetta of Carracoorte	W. Henderson	,,	5,817	4·35	253·14	Fritz of Rythdale
462	Cambria	Mrs. M. E. Carroll	Red Poll	6,220	4·06	252·54	Nicotine
463	Chance	T. H. Payne	,,	6,368	3·96	252·06	Honingham Alake 3rd (imp.)
464	Queen of Golden Vein	J. W. Cochrane	Ayrshire	6,609	3·81	251·82	Fossiker of Golden Vein
465	Roan Ada 4th	F. G. Sadler	Shorthorn	7,275	3·45	251·03	43rd Earl of Pentland
466	Nora 3rd of Gleneira	C. Lees	Ayrshire	5,342	4·70	251·00	Jock of Gowan Bank
467	Flora of Roseneath	R. Goodman	,,	5,769	4·35	250·75	Norma's Progress
468	Noble Coquette	Miss B. Reid	Jersey	4,639	5·40	250·73	Castor's Premier
469	Bluebell 2nd of Werribee	F. Bidgood	,,	4,731	5·30	250·73	Northwood King
470	Lady Thenea Alcarta Van Raeelands	Flack and Sewell	Friesian	7,885	3·18	250·62	King Alcartra Rozines Fayne
471	Morven Cressida 2nd	Kerr Bros	Shorthorn	6,201	4·03	250·10	Charming Duke 27th

Cows under 4 Years of Age—200 lbs. Standard.

Order of Merit	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat	Sire.
				lbs.		lbs.	
1	Empress of Jerseyholm	T. Harvey ..	Jersey ..	8,952	5·86	524·44	Emperor
2	Gold Bell of Methven ..	C. Deverell . ..	,, ..	10,995	4·60	516·22	Bloodshot of Tarnpirr
3	Daffodil Mercena ..	A.W. Jones and Son	Friesian	12,917	3·75	484·22	King Mercena
4	Cherry of Willow Park..	W. K. Atkinson ..	Shorthorn	12,017	3·94	474·06	Havelock of Darbalara
5	Buttermaid 2nd ..	A. W. Jones and Son	Friesian	11,287	3·92	441·92	King Mercena
6	Jessie 24th of Melrose ..	W. Woodmason ..	Jersey ..	7,251	5·84	423·74	Golden Fern's Viscount (imp.)
7	Queen Curly	A W Jones and Son	Friesian	11,985	3·52	421·69	King Mercena
8	Hibiscus of Springhurst	H. Luxton ..	Jersey ..	8,278	5·03	416·47	Petain
9	Monavale Catriona Paxton	Flack and Sewell ..	Friesian	11,846	3·48	412·49	Prince Pietje Paxton
10	Cordyline Inka de Kol	A. W. Jones and Son	,, ..	10,153	3·94	400·81	Cordyline Colantha Hero
11	Grevillea of Springhurst	H Luxton ..	Jersey ..	6,806	5·87	399·27	Attraction of Springhurst
12	Bonnie of Belgonia ..	P. J. Maloney ..	,, ..	7,769	5·14	399·22	Butterlad of Bonshaw
13	Romneva of Springhurst	J. D Read ..	,, ..	7,750	5·08	394·01	Petain
14	Lucy Grey of Colac ..	T. R Findlay	,, ..	8,113	4·80	389·47	Lady Grey 4th's Fox
15	Monovale Juno Paxton	J. Platfuss ..	Friesian	11,913	3·26	387·92	Prince Pietje Paxton
16	Tea Rose of Tarnpirr	Mrs E. M. Lennie..	Jersey ..	6,216	6·22	387·66	Treasure of Tarnpirr
17	Blanche of Willow Park	W. K. Atkinson ..	Shorthorn	9,460	4·08	385·74	Havelock of Darbalara
18	Treasure of Medburn Grove	C. Bamford	Ayrshire	8,478	4·54	385·26	St Elfred of Willow Vale
19	Adela of Woodstock Grange	H D W. Canobio..	,, ..	8,652	4·44	384·53	Combine of Glengowrie
20	Jessie 11th of Ferntree Vale	J Phillips	Jersey	8,616	4·46	383·87	Starbright Renard
21	Plumbago of Springhurst	J D. Read ..	,, ..	7,694	4·98	382·51	Petain
22	Mayflower of Sparrovale	Geelong Harbour Trust	Ayrshire	8,357	4·55	380·03	Jamie of Sparrovale
23	Bertha of Winslade .	C. Lees ..	,,	8,316	4·56	379·2[illegible]	Bowler of Seafield
24	Bolobek Annie ..	O. J Syme ..	Friesian	10,270	3·68	377·92	Rhoda Prince Rubicon
25	Ina of Craigneil .	A. W. Jones and Son	,, ..	10,867	3·47	376·97	King Mercena
26	Bolobek Blue Bell .	O. J. Syme ..	,, ..	11,293	3·32	374·84	Johanna Lad
27	Phyllis 2nd of Warenda	T. Mosley ..	Jersey ..	7,411	5·01	373·46	Jessie's Handsome Boy
28	Trefoil 2nd of Springhurst	J. D. Read .	,, ..	6,644	5·61	372·63	Attraction of Spinghurst
29	Valdas Belle of Somerville	H. Luxton ..	,, ..	6,018	6·17	371·80	Daphne's Prince of Somerville
30	Graceful Countess 2nd of Lesterfield	P. Chirnside ..	,, ..	5,863	6·30	369·45	Quality 6th's Son of Melrose
31	Gaiety Girl 10th of Melrose	W. Woodmason ..	,, ..	5,940	6·21	368·70	Golden Fern's Viscount (imp.)
32	Blush of Willow Park ..	W. K. Atkinson .	Shorthorn	8,915	4·12	367·62	Havelock of Darbalara
33	Clover of Saranac ..	R Faragher .	Jersey ..	5,426	6·71	364·06	Lord Richmond
34	Waituki Princess Aleisha	J. Carter ..	Friesian	8,829	4·12	363·72	Royal Prince Pietertje de Kol
35	Tiny of Meadowvale .	W H. Atherton ..	Jersey ..	5,665	6·37	360·95	Mythics Choice of Tarnpirr
36	Tulip 2nd of Meridale ..	Finn Bros. ..	,, ..	6,915	5·18	358·45	Dinah's Model of Kings Vale
37	Lily of Craigneil	A. W. Jones and Son	Friesian	9,312	3·83	356·93	Canterbury Statesman
38	Marguerite of Springhurst	J. D. Read ..	Jersey ..	6,239	5·71	356·56	Petain
39	Flower 14th of Melrose..	A. L. N. Walter ..	,, ..	6,099	5·84	356·40	Golden Fern's Viscount (imp.)
40	Linda of Medburn Grove	C. Bamford ..	Ayrshire	9,059	3·92	355·47	Lord Harry
41	Dahlia of Springhurst ..	J. D. Read ..	Jersey ..	5,660	6·27	354·90	Petain
42	Buttercup of Glenmore	W. Meredith ..	Ayrshire	9,318	3·80	354·37	Lavendo of Glencairn
43	Alvie of Roseleigh ..	G. Gange ..	,, ..	8,023	4·41	353·54	Burleigh of Gowrie Park
44	Bolobek Janet ..	J. Wills	Friesian	9,778	3·58	350·40	Rhoda Prince of Rubicon
45	Melilot of Springhurst ..	J D. Read ..	Jersey .	6,412	5·46	350·39	Petain
46	May Queen of Brookside	W. Tendeson ..	,, ..	8,026	4·36	349·94	Reynald's Twylish
47	Stately of Craigneil ..	A. W Jones and Son	Friesian	10,294	3·40	349·59	Canterbury Statesman
48	Bolobek Jessie ..	O. J. Syme ..	,, ..	9,433	3·71	349·40	Rhoda Prince of Rubicon
49	Boronia of Woodstock Grange	H. D W. Canobio	Ayrshire	7,359	4·74	349·00	Combine of Glengowrie
50	Keepsake of Warenda ..	T. Mesley .	Jersey ..	5,593	6·24	348·86	Jessie's Handsome Boy
51	Biddy of Kelburn ..	Mrs. I. Beard ..	,, ..	6,612	5·27	348·78	Music 3rd's Son of Melrose
52	Neat Lady of Springvale	R. C. Campbell ..	,, ..	5,995	5·81	348·31	Admiral
53	Joy of Tarnpirr ..	F. Trevaskis ..	,, ..	5,636	6·17	347·58	My Queen's Choice of Tarnpirr
54	Highland Fling ..	Warragul High School	Red Poll	8,790	3·93	346·09	Victoria Flight Commander
55	Parrot of Glenwood ..	W. Tendeson ..	Jersey ..	6,508	5·32	346·06	Carrie's 5th Noble of Melrose
56	Countess 2nd of Springhurst	J. D. Read ..	,, ..	6,398	5·40	345·23	Attraction of Springhurst
57	Velveteen 4th of Banyule	Lyon and Kerr ..	,, ..	6,743	5·11	344·88	Audrey's Lord Twylish
58	Milkmaid of Staghorn ..	F. Bidgood ..	,, ..	6,177	5·52	341·26	Favourite's Noble
59	War Wings	Department of Agriculture	Red Poll	8,660	3·91	338·89	Longford Major (Imp.)
60	Lady Patty of Ferndale	W. M. Vale ..	Jersey ..	6,377	5·30	338·12	Lord Grey
61	Cantata of Banyule ..	Lyon and Kerr ..	,, ..	6,347	5·32	337·84	Audrey's Lord Twylish
62	Lady Grey 14th of St. Albans	H. Luxton ..	,, ..	6,113	5·52	337·32	Brighton King 8th

Cows under 4 Years of Age—200 lbs. Standard—*continued.*

Order of Merit	Name	Owner	Breed	Milk	Average Test	Butter Fat	Sire
				lbs		lbs	
63	Orange Blossom of Tarnpirr	Alston Estate	Jersey	6,924	4·85	336·14	My Queen's Choice of Tarnpirr
64	Regina of Tarnpirr	Alston Estate	"	5,440	6·18	336·14	Amy's Choice of Tarnpirr
65	Trixie of Medburn Grove	C. Bamford	Ayrshire	6,683	5·02	335·54	St. Elfred of Willowvale
66	Mezzo of Banyule	Lyon and Kerr	Jersey	5,896	5·66	333·92	Audrey's Lord Twylish
67	Lady Pirie	J. T. Tweddle	Friesian	10,192	3·26	332·46	Springfield Champion
68	Fuchsia of Springhurst	E. A. Denis	Jersey	6,381	5·19	331·42	Attraction of Springhurst
69	Kitty 2nd of Somerset	A. E. Batson	"	4,816	6·72	325·44	Lord Grey 2nd's Golden Spark
70	Gold Lass of Brookside	W. Tendeson	"	6,524	4·98	324·50	Reynard's Twylish
71	Queen's Princess of Clover Flat	F. Raggatt	"	7,152	4·52	323·14	Prince Noreen
72	Bolobek Edith	O. J. Syme	Friesian	8,545	3·77	322·45	Johanna Lad
73	Bluebell of Strathbow	F. Raggatt	Jersey	5,891	5·45	321·17	Mac of Tarnpirr
74	Lady Grey 11th of St. Albans	A. W. Jones and Son	"	5,867	5·47	321·10	Lady Grey 2nd's Golden Spark
75	Rosella 8th of Kingsvale	J. Anderson, junr.	"	6,165	5·21	320·92	Carnation's Fancy Northwood King
76	Topsy of Evergreen	H. S. Gibson	Ayrshire	7,401	4·47	320·51	Luminous of Drayton
77	Gowan of Sparrovale	Geelong Harbour Trust	"	6,588	4·81	317·05	Jamie of Sparrovale
78	Pansy 6th of Ferntree Vale	E. A. Denis	Jersey	5,698	5·56	315·56	Starbright Renard
79	Bloom of Banyule	W. C. Cayley	Ayrshire	7,467	4·22	315·19	Duke of Chatsworth
80	Victoria Dutch Belle	Department of Agriculture	Friesian	8,768	3·58	313·53	Dominion Domino Dutch Boy
81	Domino Fobes of Yarra Brae	Flack and Sewell	"	9,527	3·27	311·95	Dominion Domino Dutch Boy
82	Starleigh of Strathbow	F. Raggatt	Jersey	5,528	5·64	311·81	Mac of Tarnpirr
83	Cora of Hyde Park	J. R. Telford	Ayrshire	7,020	4·44	311·48	Modesty's Implex of Glencairn
84	Mary Birt of Kelburn	Mrs. I. Beard	Jersey	5,614	5·54	311·13	Southern King 2nd
85	Noorat Deception	Mrs. A. Black	"	5,728	5·36	307·25	Milklad of Banyule
86	Prim Patch of Yarra Brae	Flack and Sewell	Friesian	8,975	3·41	305·85	Longbeach Big Patch
87	Waituki Princess Abigail	A. W. Jones and Son	"	9,000	3·39	305·41	Royal Prince Pietertje de Kol
88	Gem of the Glen	H. Luxton	Jersey	4,808	6·34	304·88	Lord Grey of Linden
89	Morocco's Pansy of Staghorn	F. Bidgood	"	5.526	5·51	304·66	Morocco Bound
90	Quality's Duchess of Tuerong	A. W. Findlay	"	5,054	6·00	303·11	Quality 6th's Son of Melrose
91	Lady Grey 12th of St. Albans	A. W. Jones and Son	"	5,089	5·94	302·46	Admiral 2nd
92	Sovereign	Department of Agriculture	Red Poll	6,830	4·42	301·55	Belligerent
93	Lotus of Banyule	Lyon and Kerr	Jersey	5,032	5·98	301·13	Clementine's King
94	Romany Girl 3rd of Tarnpirr	Alston Estate	"	4,670	6·41	299·48	Prince of Tarnpirr
95	Twill of Banyule	Lyon and Kerr	"	5,614	5·33	299·01	Audrey's Lord Twylish
96	Bloomer of Medburn Grove	C. Bamford	Ayrshire	6,977	4·28	298·52	St. Elfred of Willowvale
97	Plum of Corriedale	Mrs. E. Lithgow	Red Poll	6,264	4·76	298·14	Redbank Persian.
98	Queenie 2nd of Willow Park	W. K. Atkinson	Shorthorn	7,649	3·88	298·01	Havelock of Dabalara
99	Lady of Belgonia	P. J. Maloney	Jersey	5,625	5·27	296·32	Lion of Bonshaw
100	Dewpop	Evans Bros.	Red Poll	6,681	4·43	296·02	Bellum Victor
101	Bright Stockings of Warenda	O. Cutler	Jersey	5,901	5·01	295·84	Brighton Cub
102	Springfield White Posch	Flack and Sewell	Friesian	7,612	3·89	295·80	Rosevale Inka Sylvia Posch
103	Modesty of Cathcart	W. J. McKernan	Ayrshire	6,289	4·70	295·40	Lavendo of Glencairn
104	Countess 2nd of Ashby	Dickinson Bros	Friesian	8,273	3·58	295·39	Bolobek General
105	Boltonia of Springhurst	J. D. Read	Jersey	5,755	5·12	294·40	Attraction of Springhurst
106	Gaiety of Medburn Grove	C. Bamford	Ayrshire	7,559	3·87	292·79	St. Elfred of Willowvale
107	Esteem of Gleneira	C. Lees	"	6,499	4·50	292·52	Kia Ora of Haydowns
108	Dainty Maid of Ben Kell	R. Ralston	"	6,103	4·79	292·34	Marvel of Willowvale
109	Ashlyn 25	J. T. Tweddle	Friesian	8,705	3·36	292·29	Black and White King of Ashlyn
110	Winnie of Kelvin Grove	N. Gange	Ayrshire	6,492	4·50	291·90	Model of Seafield
111	Rosemary of Springhurst	J. D. Read	Jersey	5,988	4·89	291·79	Petain
112	Canary of Tuerong	A. W. Findlay	"	5,326	5·45	290·31	Quality's 6th Son of Melrose
113	Aspect	C. Lees	Ayrshire	7,211	4·02	290·19	Jock of Gowan Bank
114	Floss of Tuerong	A. W. Findlay	Jersey	5,538	5·24	289·95	Quality's 6th Son of Melrose
115	Primrose of Winslade	C. Lees	Ayrshire	5,542	5·19	287·77	Bowler of Seafield
116	Spot of Medburn Grove	C. Bamford	"	6,449	4·45	286·78	St. Elfred of Willowvale
117	Florrie of Warenda	T. Mesley	Jersey	4,975	5·76	286·77	Jessie's Handsome Boy of Melrose

COWS UNDER 4 YEARS OF AGE—200 LBS. STANDARD—*continued.*

Order of Merit	Name	Owner	Breed	Milk	Average Test	Butter Fat	Sire
				lbs.		lbs	
118	Queen of Wollingurry ..	A Joshua ..	Jersey ..	5,643	5·08	286·67	Soprano's Mystifier of Woolingurry
119	Baronia of Woodbyne ..	J. Benallack ..	Ayrshire	6,465	4·43	286·56	Bailce of Oakbank
120	Oatlands Annie ..	J. Thorburn .	„ ..	5,947	4·80	285·54	Douglas of Drayton
121	Ruby of Tarnpirr ..	D C Miller ..	Jersey ..	5,429	5·25	284·78	Eminent V.C.
122	Seville of Kelburn ..	A. Robertson ..	„ ..	4,603	6·12	281·52	Noble Lad of Kelburn
123	Syringa of Springhurst ..	H. Luxton ..	„ ..	4,502	6·24	280·87	Brighton Cub
124	Fairy Queen of Springvale	R C. Campbell .	„ ..	5,344	5·25	280·32	Comedy King of St. Albans
125	Romany Girl 2nd of Tarnpirr	F Trevaskis ..	„ ..	5,145	5·44	279·90	First Choice of Melrose
126	Mirror of Sunnyside ..	A. E. Castle ..	Ayrshire	7,416	3·76	278·57	Bernie of Oakbank
127	Carrie of Hill View ..	Mrs. E. O'Donoghue	„ ..	6,281	4·43	278·29	Majestic of Drayton
128	Banksia . ..	Department of Agriculture	Red Poll	6,047	4·59	277·86	Belligerent
129	Foliage of Golden Vein ..	W. McIvor ..	Ayrshire	6,392	4·34	277·62	Sergeant of Golden Vein
130	Ruby of Springfield ..	J W. Cochrane ..	„ ..	6,778	4·08	276·96	Beauty's Majestic of Gleneira
131	Patience of Ben Kell ..	R Ralston ..	„ ..	6,427	4·30	276·63	Marvel of Willowvale
132	Ashlyn 33	J T. Tweddle ..	Friesian	7,494	3·69	276·62	Black and White King Ashlyn
133	Morocco's Choice of Kirkhill	D. C. Miller ..	Jersey ..	4,618	5·95	274·97	Blanchette's Fox
134	Miss Muller 3rd of Berry	Flack and Sewell ..	Friesian	8,128	3·37	274·70	Marquis of Berry
135	Belle of Craignell ..	A. W. Jones and Son	„ ..	7,406	3·71	274·67	Sir Kol of Canada
136	Honey of Wanalta ..	C. W. W. Macauley	Jersey ..	5,552	4·95	274·64	Noble Voice of Banyule
137	Margaret's Fancy of Somerset	A. E. Batson .	„ ..	5,019	5·46	274·02	Admiral
138	Heather of Range View	C. Lees .. .	Ayrshire	5,939	4·61	273·77	Noble Mac of Glen Avon
139	Goldfinch of Fair View ..	A. A. Broad .	Jersey ..	5,118	5·34	273·25	Antonio
140	Snowdrop of Inverleigh	A H. Schier ..	Ayrshire	6,322	4·32	273·13	Major of Gowrie Park
141	Muriel 2nd of Somerset	A. E. Batson ..	Jersey ..	4,926	5·54	273·06	Lady Grey 2nd's Golden Spark
142	Plumstead Permain ..	T. H. Payne ..	Red Poll	6,401	4·26	272·89	Plumstead Pearl
143	Olive Berry of Glenbrae	M. and W. A. Francis	Ayrshire	6,721	4·06	272·63	Warlock of Fernhill
144	Butter Queen 2nd of Meryula	A. W. Jones and Son	Jersey ..	4,826	5·64	272·41	Meryula
145	Rita of Hill View ..	Mrs. C. O'Donoghue	Ayrshire	6,089	4·45	270·71	Majestic of Drayton
146	Eva 2nd of Glencairn ..	G. Gange ..	„ ..	6,596	4·01	270·44	Lavendo of Glencairn
147	Marilla of Burnside ..	C. Lees	„ ..	6,845	3·94	269·74	Gregor of Oakband
148	Samara	Department of Agriculture	Red Poll	5,903	4·56	269·52	High Flier
149	Lady Elector 7th of Melrose	W. Woodmason ..	Jersey ..	4,832	5·56	268·77	Golden Fern's Viscount (Imp.
150	Wisteria of Kelvin Grove	G. Gange ..	Ayrshire	6,644	4·02	267·08	Model of Seafield
151	Daphne of Hillcrest ..	F. G. Sadler ..	Shorthorn	6,615	4·03	266·76	Morven Charming Duke 6th
152	Model of Woodstock Grange	H D. W. Canobio ..	Ayrshire	5,639	4·72	266·51	Combine of Glengowrie
153	Star of Kelvin Grove ..	W J. McKernan ..	„ ..	6,235	4·27	266·23	Model of Seafield
154	Fancybread of Glen Iris	C. D. Lloyd ..	Jersey ..	5,003	5·32	265·91	Brown Chief
155	Trixie of Hillcrest ..	C. J. Griffiths ..	„ ..	5,106	5·21	265·84	Bell Boy of Hillcrest
156	Fancy of Fairview ..	A. E. Haughton ..	„ ..	5,288	4·99	264·04	Jolly Mike
157	Dairymaid of Evergreen	H. S. Gibson ..	Ayrshire	6,583	4·00	263·53	Luminous of Drayton
158	St. Albans Lily ..	S. Russell ..	Friesian	8,142	3·23	263·31	Burdett's Prince
159	Azelia 2nd of Ferndale ..	G. Gange ..	Ayrshire	5,360	4·91	363·23	Glen Elgin's Ian
160	Empress of Holly Green	H. Webb	„ ..	6,110	4·31	263·17	Marcus of Holly Green
161	Jubilee Periwinkle ..	Miss B. Reid ..	Jersey ..	4,453	5·86	261·02	Bundoora Jubilee Fox
162	Pomahaka Snowflake ..	J Wills	Friesian	7,904	3·29	260·28	Springfield Champion
163	Tulip of Jerseyvale ..	Mrs. L. Orchard ..	Jersey ..	5,150	5·05	260·18	Golden Twylish
164	Rosetta of Kyle ..	W. T. Cullen ..	Ayrshire	6,181	4·20	259·33	Forman of Gowrie Park
165	Jessemia 13th of Kingsvale	F. W. Beischer ..	Jersey ..	4,349	5·94	258·30	Bonnie Lad of Kings Vale
166	Favourite of Ben Kell ..	R. Ralston ..	Ayrshire	5,948	4·34	258·24	Marvel of Willowvale
167	Jessie of Welbourne ..	G. Rowe ..	Jersey ..	5,872	4·39	257·83	Young Premier
168	Royal Princess 2nd of Golden Vein	W. McIvor ..	Ayrshire	6,454	3·99	257·64	Sergeant of Golden Vein
169	Phyllis of Dunachton ..	R. Hall	„ ..	6,073	4·24	257·62	Laurie of Dunachton
170	Lily of Wattle Bank ..	A. Kirby ..	„ ..	5,722	4·47	256·05	Brownie of Gowrie Park
171	Springfield No. 4 ..	Flack and Sewell ..	Friesian	6,951	3·68	255·85	Rosevale Inka Sylvia Posch
172	Monavale Primrose Paxton	Flack and Sewell ..	„ ..	6,971	3·67	255·63	Prince Pietje Paxton
173	Jenny Lind 16th of Melrose	E. A. Denis ..	Jersey ..	3,868	6·59	255·03	Golden Fern's Viscount (Imp.)
174	Noreen of Golden Vein ..	W. McIvor ..	Ayrshire	6,044	4·21	254·37	Earl of Golden Vein
175	Patch of Banyule ..	H. Perdriau ..	„ ..	5,318	4·77	253·89	Rational of Oakbank
176	Japana	G. A. Waite ..	Friesian	7,207	3·52	253·83	Count Togo
177	Ideal of Ben Kell ..	R. Ralston ..	„ ..	6,245	4·06	253·81	Marvel of Willowvale
178	Cher Amie 3rd of Banyule	McFarlane Bros. ..	Ayrshire	6,251	4·04	252·37	Loyal of Oakbank

COWS UNDER 4 YEARS OF AGE—200 LBS. STANDARD—*continued.*

Order of Merit	Name	Owner	Breed.	Milk.	Average Test.	Butter Fat.	Sire
				lbs		lbs.	
179	Jubilee Tecoma	Miss B. Reid	Jersey	5,245	4·81	252·31	Twylish Madiera's Fox 2nd of Werribee
180	Minetta of Kyle	W. T. Cullen	Ayrshire	6,427	3·92	251·72	Prince Rupert of Langley Park
181	Segis Hengerveld of Lydholme	Flack and Sewell	Friesian	7,558	3·33	251·53	Cluny Hengerveld of Lydholme
182	Gwen	S. Russell	,,	6,506	3·85	250·19	Count Togo
183	Noorat Cherry	Mrs. A. Black	Jersey	4,304	5·81	250·14	Milklad of Banyule
184	Pearline of Retreat	W. J. Muhlebach	Ayrshire	5,896	4·24	249·91	Musician of Willow Vale
185	Ashlyn 85	J. T. Tweddle	Friesian	6,256	3·99	249·78	Royal King Champion
186	Rose of Langley Park	Callery Bros.	Ayrshire	5,961	4·17	248·49	Playaway of Willowvale
187	Gem of Evergreen	H. S. Gibson	,,	6,230	3·99	248·48	Luminous of Drayton
188	Lupin of Ellerslie	H. S. Gibson	,,	6,591	3·76	248·02	Minstrel of Glencairn
189	Duchess of Locheden	W. J. McKernan	,,	5,605	4·41	247·19	Harry of Golden Vein
190	Modesty of Inverleigh	A. H. Schier	,,	6,576	3·76	247·09	Major of Gowrie Park
191	Peeress of Ben Kell	R. Ralston	,,	6,170	4·00	246·56	Desmond of Ben Kell
192	Viola of Dunachton	R. Hall	,,	7,034	3·50	246·31	Adela's Jamie of Raith
193	Rye Cake of Glen Iris	C. D. Lloyd	Jersey	4,121	5·98	246·23	Cream Chief of Glen Iris
194	Mervette	Evans Bros.	Red Poll	5,409	4·54	245·81	Bellum Victor
195	Heather Bell of Ayr Brae	McFarlane Bros.	Ayrshire	6,108	4·02	245·53	Harmonist of Ellerslie
196	Maudie 2nd of Retreat	N. Gange	,,	7,098	3·45	245·09	Musician of Willowvale
197	Victoria Dutchmaid	Department of Agriculture	Friesian	6,351	3·85	244·30	Dominion Domino Dutch Boy
198	Queen Mab of Hillcrest	A. Robertson	Jersey	4,678	5·22	244·22	Bell Boy of Hillcrest
199	Peggy of Woolamai Park	G. Kent	Ayrshire	5,436	4·49	244·22	Prince of Mapleton
200	Gladiana of La Trobe	Sale High School	,,	4,678	5·21	243·69	Darnley of Gowrie Park
201	Oatlands Maggie	J. Thorburn	Ayrshire	5,594	4·33	243·37	Malster of Seafield
202	White Cake of Glen Iris	C. D. Lloyd	Jersey	4,565	5·31	242·57	Brown Chief
203	Gladsome of Roxburgh	T. Douglas	Ayrshire	6,570	3·63	238·72	Good Lad of Roxburgh
204	Petal of Roseleigh	N. Gange	,,	6,571	3·63	238·26	Burleigh of Gowrie Park
205	Oatlands Beauty	J. Thorburn	,,	5,263	4·53	238·17	Malster of Seafield
206	Lady Em of Ever Green	H. S. Gibson	,,	5,820	4·07	237·67	General Gordon
207	Audrey's Victress of Somerville	H. Luxton	Jersey	4,381	5·40	236·69	Daphne's Prince
208	Elsie of Glencourt	H. Munro	Ayrshire	6,146	3·85	236·33	Bonny Chief of Gowrie Park
209	La Marseillaise	Department of Agriculture	Red Poll	6,104	3·86	235·38	Longford Major (Imp.)
210	Lassie of Ayr Brae	McFarlane Bros.	Ayrshire	6,223	3·78	235·37	Harmonist of Ellerslie
211	Sweet Pansy of Fair View	Miss S. L. Robinson	Jersey	4,732	4·94	234·74	Sir Antonio
212	Model of Kirkhill	D. C. Miller	,,	4,237	5·54	233·90	Favourite's 4th Noble
213	Lady Bell of Invergordon	C. G. Newton	Ayrshire	5,365	4·33	232·45	Cocky Rab of Gleneira
214	Japana	Smith and Sons	Friesian	6,970	3·33	232·08	Count Togo
215	Jean of La Motte	J. Thorburn	Ayrshire	5,336	4·14	228·93	Malster of Seafield
216	Gladys of Sparrovale	Geelong Harbour Trust	,,	5,173	4·41	227·90	Scottish King of Gowrie Park
217	Silvermine 3rd of Clover Flat	F. Baggatt	Jersey	4,787	4·76	227·81	Prince Noreen
218	Adella of Ben Kell	R. Ralston	Ayrshire	5,497	4·12	226·48	Girvan of Oakbank
219	Princess of Winslade	H. S. Gibson	,,	4,552	4·97	226·25	Bowler of Seafield
220	Satsuma	G. A. Waite	Friesian	6,086	3·68	225·12	Count Togo
221	Fidgett 2nd of Warrook	Cockbill and Gibbs	Ayrshire	5,963	3·75	222·81	Lena's Frederick
222	Grace of Roseleigh	G. Gange	,,	5,538	4·02	222·64	Burleigh of Gowrie Park
223	Brilliant 2nd of Kilmarnock	Sadler Bros.	,,	5,149	4·32	222·56	Laura's Laird of Gowrie Park
224	Milkmaid of Inverleigh	A. H. Schier	,,	5,688	3·91	222·44	Major of Gowrie Park
225	Tottie of Warrook	Cockbill and Gibbs	,,	5,087	4·36	221·96	Triumph of Warrook
226	Jennie of Burnside	Cockbill and Gibbs	,,	4,878	4·52	220·39	Ventry of Seafield
227	Sunshine of Roxburgh	Cockbill and Gibbs	,,	5,163	4·25	219·61	Good Lad of Roxburgh
228	Flower of Roseleigh	N. Gange	,,	5,274	4·16	219·44	Baron of Roseleigh
229	Bonny Jean of Invergordon	C. G. Newton	,,	5,350	4·10	219·42	Cocky Rab of Gleneira
230	Prudence of Roxburgh	A. H. Schier	,,	5,967	3·64	217·34	Good Lad of Roxburgh
231	Heronine 2nd of Garden Vale	R. C. Campbell	Jersey	4,300	5·05	217·24	Doreen's Chief
232	Linda of Tuerong	A. W. Findlay	,,	4,527	4·79	216·87	Bonnie Lad of Kings Vale
233	Good Luck of Glenora	Cockbill and Gibbs	Ayrshire	5,144	4·21	216·66	Good Lad of Roxburgh
234	Duchess of Hillcrest	M. and W. A. Francis	,,	4,964	4·36	216·26	Prince of Mapleton
235	Corona	Department of Agriculture	Red Poll	5,484	3·94	216·05	Nicotine
236	Bright Jewell 2nd of St. Albans	R. Faragher	Jersey	3,517	6·13	215·54	Brighton King 8th
237	Jessie de Kol Kroons	J. T. Tweddle	Friesian	5,967	3·61	215·28	Dominion Domino Dutch Lad
238	Veronica of Ben Kell	R. Ralston	Ayrshire	5,305	4·06	215·15	Girvan of Oakbank
239	Pearl Queen of Wethersdane	A. H. Schier	,,	5,314	4·01	213·28	His Majesty of Wethersdane

COWS UNDER 4 YEARS OF AGE—200 LBS. STANDARD—*continued.*

Order of Merit	Name	Owner	Breed	Milk	Average Test	Butter Fat	Sire
				lbs		lbs.	
240	Bramble 2nd of Linden	H. Luxton ..	Jersey ..	3,852	5·51	212·22	Annette's Chief of Linden
241	Gladwyn of La Trobe ..	Sale High School ..	Ayrshire	4,579	4·63	211·90	Darnley of Gowrie Park
242	Fine Quality of Gleneira	A. H. Schier .	,, ..	4,557	4·37	209·26	Kia Ora of Haydowns
243	Oatlands Nancy .	J. Thorburn .	,, ..	5,244	3·99	208·37	Malster of Seafield
244	Vellum . .	Evans Bros. ..	Red Poll	5,727	3·64	208·19	Bellum Victor
245	Peerless of Meadow Vale	J. Hunter	Jersey ..	3,757	5·51	207·13	Handsome Lad
246	Pattie of Hillcrest	G. Rowe	,, .	4,356	4·69	204·41	Bell Boy of Hillcrest
247	Sunshine of Roxburgh	Cockbill and Gibbs	Ayrshire	4,919	4·14	203·45	Good Lad of Roxburgh
248	Madeline of Inverleigh	A. H. Schier .	,, ..	4,562	4·44	202·66	Lavendo of Glencairn
249	Profit of Roxburgh .	A. H. Schier .	,, ..	5,604	3·61	202·24	Good Lad of Roxburgh
250	Rocket of Ruhbank .	Miss C. L. Robinson	Jersey ..	3,367	5·99	201·76	Kyora's Lotina's Financia King
251	Oatlands Peg .	J. Thorburn .	Ayrshire	4,554	4·41	200·83	Malster of Seafield
252	Gem of Hillcrest .	G. Rowe ..	Jersey ..	4,292	4·67	200·62	Bell Boy of Hillcrest
253	Moss Rose 8th	F. G. Sadler	Shorthorn	4,658	4·30	200·51	43rd Earl of Pentland

Heifers—175 lbs. Standard.

Order of Merit	Name	Owner	Breed	Milk.	Average Test.	Butter Fat	Sire
				lbs.		lbs	
1	Patricia of Warenda .	W. H. Axford .	Jersey .	7,865	6·18	486·30	Jessie's Handsome Boy
2	Miss Guy of Tarnpirr .	F. Trevaskis .	,, ..	7,422	6·08	451·54	Mythic's Choice
3	Lady Lauder of Warenda	W. H. Axford .	,, .	6,419	6·60	423·52	Choirmaster of Warenda
4	Lady Marge 2nd of Jerseyholm	T. Harvey .	,, .	7,410	5·46	404·79	Emperor
5	Canary 12th of King's Vale	J. Anderson, junr ..	,, .	7,582	5·33	404·17	Bonny Lad of King's Vale
6	Carmen of Hillcrest .	W. H. Axford .	,, ..	6,944	5·81	403·53	Bell Boy of Hillcrest
7	Beauty of Belgonia .	P. J. Maloney .	,, ..	7,738	5·16	399·76	Butter Lad of Bonshaw
8	Harpsichord of Banyule	Lyon and Kerr ..	,, ..	8,358	4·77	398·38	Audrey's Lord Twylish
9	Sparkle 4th of Jerseyholm	T. Harvey .	,, ..	7,312	5·37	392·85	New Alliance
10	Burnbank Woodcrest Segis	Flack and Sewell .	Friesian	10,669	3·62	386·34	Dominion Woodcrest Plebe Mercedes
11	Westmere Oakwood Pride	J. Platfuss ..	,,	11,620	3·37	380·45	Dominion Oakwood
12	Silvermine 23rd of Banyule	C. G. Lyon ..	Jersey ..	7,233	5·20	376·09	Audrey's Lord Twylish
13	Maitland's Petal of Elouera	C. G. Lyon ..	,, ..	6,607	5·68	375·09	Audrey's Lord Twylish
14	Lantana 2nd of Springhurst	C. Deverell ..	,, ..	6,018	6·23	374·74	Kerensky of Springhurst
15	Tiny of Meadowvale ..	W. H. Atherton .	,, ..	5,883	6·35	373·59	Mythic's Choice
16	Linda 52nd of King's Vale	J. Anderson, junr...	,, ..	6,249	5·84	364·91	Bonnie Lad of King's Vale
17	Viola 5th of King's Vale	J. Anderson, junr.	Jersey ..	6,762	5·30	358·69	Bonny Lad of King's Vale
18	Springfield No. 9 ..	S. Russell ..	Friesian	9,824	3·63	356·82	Rosevale Inka Sylvia Posch
19	Silver Mist 2nd of Kameruka	Lyon and Kerr .	Jersey .	6,403	5·55	355·27	Mystifier
20	Rosevale Jessie Posch ..	J. T. Tweddle ..	Friesian	10,829	3·27	353·62	Rosevale Korndyke Sylvia Posch
21	Westmere Oakwood Duchess	J. Platfuss ..	,, .	10,319	3·41	351·95	Dominion Oakwood
22	St. Alban's Netherland Princess	A. W. Jones and Son	,, ..	10,289	3·40	349·89	Westmere Prince Mercedes
23	Graceful Duchess 22nd of Melrose	W. Woodmason ..	Jersey ..	5,781	6·05	349·77	Golden Fern's Viscount
24	Westmere Inka Pietertje	A. W. Jones and Son	Friesian	8,925	3·90	348·50	Pietertje Netherlands Paul
25	Rosevale Rosie Abberkerk	J. T. Tweddle ..	,, ..	11,398	3·05	347·42	Rosevale Korndyke Sylvia Posch
26	Show Girl of Tarnpirr ..	Mrs. E. M. Lennie..	Jersey ..	6,265	5·53	346·36	Linda's Record of King's Vale
27	My Luck of Tarnpirr	W. Tendeson ..	,, ..	5,924	5·80	343·87	Arcadia's Choice
28	Starbright's Princess ..	C. D. Lloyd ..	,, ..	5,442	6·31	343·32	Island Northwood Satisfaction
29	Northwood Queen of Somerville	J. Hutchinson ..	,, ..	6,689	5·03	336·57	Werribee Maderia Northwood King
30	Bonnie of Belgonia ..	P. J. Maloney ..	,, ..	6,084	5·49	334·24	Butterlad of Bonshaw

Heifers—175 lbs. Standard—*continued.*

Order of Merit.	Name	Owner.	Breed	Milk	Average Test	Butter Fat.	Sire
				lbs		lbs.	
31	Werribee Wyandotte Cream	F E. Wilcox ..	Jersey ..	6,320	5·29	334·15	Werribee Wyandotte Fancy
32	Rarity of Meadowvale ..	W. H. Atherton ..	,, ..	5,263	6·28	330·52	Handsome Lad
33	Beauty of St. Albans ..	A. W. Jones and Son	,, .	5,878	5·61	329·79	Eminent V.C.
34	Gold Bird of Methven ..	C. Deverell ..	,, ..	6,034	5·45	328·98	Haigh of Springhurst
35	Fuchsia of St. Albans ..	A. W. Jones and Son	,, ..	6,399	5·12	327·54	Brighton King 8th
36	Mystery 22nd of Melrose	A. W. Jones and Son	,, ..	4,702	6·92	325·36	Jessie 15th's Handsome Boy of Melrose
37	Lassie 5th of Clover Flat	F. Raggatt ..	,, ..	6,282	5·12	321·6	Curious King
38	Blush of Willow Park ..	W. K. Atkinson ..	Shorthorn	8,144	3·93	320·02	Havelock of Darbalara
39	Bolobek Frieda .	O. J Syme	Friesian	8,619	3·72	319·61	Rhoda's Prince of Rubicon
40	Tulip 2nd of Springhurst	J. D Read ..	Jersey ..	5,639	5·61	316·47	Attraction of Springhurst
41	Westmere Ponteac Gem2nd	A. W. Jones and Son	Friesian	9,122	3·47	316·43	Woodcrest Pietertje Ponteac
42	Lady Monica 12th ..	J Anderson, junr.	Jersey ..	5,214	5·99	312·57	Jessemias Imperial 5th of King's Vale
43	Bolobek Dora ..	O. J. Syme ..	Friesian	8,073	3·87	312·44	Johanna Lad
44	Dimple of Craigneil ..	S Russell ..	,, ..	8,767	3·55	311·48	King Mercena
45	Dora of Woodstock Grange	H. D. W Canobio ..	Ayrshire	7,142	4·34	311·36	Combine of Glengowrie
46	Lady Grey 15th of St. Albans	A. W. Jones and Son	Jersey ..	5,987	5·20	311·14	Brighton King 8th
47	Tuberose of Springhurst	J. D Read ..	,, .	6,127	5·07	310·86	Attraction of Springhurst
48	Violet 3rd of Lake Valley	G. Vallance ..	Ayrshire	7,295	4·26	310·84	Joffre of Yalart
49	Victoria Dutch Wood ..	Department of Agriculture	Friesian	8,301	3·73	309·81	Domino Dutch Boy
50	Brilliance of Kelburn .	Mrs. I. Beard ..	Jersey ..	5,681	5·45	309·49	Noble's Lad of Kelburn
51	Burnbank Mercedes Maggie	Flack and Sewell ..	Friesian	9,326	3·30	307·32	Dominion Gay Mercedes
52	Model of Holly Green ..	H. L Webb ..	Ayrshire	7,484	4·11	307·29	Maxwell of Gleneira
53	Silver Fern 2nd of Kameruka	Lyon and Kerr ..	Jersey ..	6,403	5·55	305·27	Mystifier
54	Tigra	Department of Agriculture	Red Poll	7,767	3·92	304·72	Nicotine
55	Vanilla 17th of Melrose	W. Woodmason ..	Jersey .	5,768	5·26	303·10	Golden Fern's Viscount (imp)
56	Colantha Curley Segis ..	O. J. Syme ..	Friesian	8,336	3·62	301·95	Cordyline Colantha Hero
57	Viola's Golden Princess	C D. Lloyd ..	Jersey .	4,869	6·20	301·91	Viola's Golden Laddie
58	Beanie of Sparrovale ..	Geelong Harbor Trust	Ayrshire	8,270	3·65	301·90	Jamie of Sparrovale
59	Lady Lene of Elouera .	H. Luxton ..	Jersey ..	6,008	5·02	301·33	Lord Richmond
60	Thora's Audrey of Elouera	Lyon and Kerr ..	,, .	5,928	5·07	300·30	Audrey's Lord Twylish
61	Marigold of Banyule ..	Lyon and Kerr ..	,, .	5,361	5·60	300·03	Audrey's Lord Twylish
62	Gaiety of Craigneil .	A. W. Jones and Son	Friesian	7,934	3·78	299·94	Neil Mercena
63	Werribee Kinglark Bluebell	F. E. Wilcox ..	Jersey ..	4,643	6·46	299·80	Werribee Island Bluebell
64	Linda of the Valley ..	Mrs. E. M Lennie ..	,, ..	5,134	5·81	298·57	Banjo of Warenda
65	Oakleaf Fobes ..	Smith and Sons ..	Friesian	8,415	3·55	298·52	Dominion Oakdale
66	Ransome Lass 2nd ..	A. W. Jones and Son	,, ..	8,304	3·59	298·45	Canterbury Statesman
67	Peggy Oride of Warenda	T. Mesley ..	Jersey	4,435	6·72	298·08	Choirmaster of Warenda
68	Bloomfield Mutual Lassie	A W. Jones and Sons	Friesian	7,785	3·83	297·84	Dominion Woodcrest Peibe Mercedes
69	Ada of Langley Park ..	Callery Bros. ..	Ayrshire	7,147	4·17	297·76	Gallant Lad of View Hill
70	Handsome Girl 10th of Melrose	W. Woodmason ..	Jersey ..	4,925	6·05	297·74	Golden Fern's Viscount (imp)
71	Bolobek Agnes ..	O. J. Syme ..	Friesian	8,833	3·37	297·74	Rhoda Prince of Rubicon
72	Silver Daisy of Terara ..	A. Joshua ..	Jersey .	4,862	6·12	297·53	Daisy Boy of Nowra
73	Pleasure of Ben Kell	R. Ralston ..	Ayrshire	6,586	4·50	297·32	Alert of Ben Kell
74	Burnbank Inka Sylvia Violet	Flack and Sewell ..	Friesian	7,235	4·11	297·26	Rosevale Inka Burkeyje
75	Lady Mac of Medburn Grove	C. Bamford ..	Ayrshire	6,670	4·40	296·15	McAlister of Gowrie Park
76	Heatherbell of Sparrovale	Geelong Harbor Trust	,, ..	6,379	4·64	296·09	Scottish King of Gowrie Park
77	Rarity 12th of Melrose ..	W. Woodmason ..	Jersey ..	4,909	6·02	295·66	Golden Fern's Viscount (imp)
78	Bahama	Department of Agriculture	Red Poll	6,734	4·36	293·59	Longford Major (imp.)
79	Beryl of Craigneil .	A. W. Jones and Son	Friesian	7,930	3·70	293·55	Canterbury Statesman
80	Milkmaid of Banyule ..	Lyon and Kerr ..	Jersey ..	6,499	4·52	293·47	Audrey's Lord Twylish
81	Zoe 6th of Melrose ..	W. Woodmason ..	,, ..	4,785	6·13	293·35	Golden Fern's Viscount (imp.)
82	Quality of Meadowvale	W. H. Atherton ..	,, ..	5,129	5·71	293·12	Handsome Lad
83	Springfield No. 4 .	Flack and Sewell ..	Friesian	8,107	3·61	292·66	Rosevale Inka Sylvia Posch
84	Bloom of Willow Park	W. K Atkinson ..	Shorthorn	7,621	3·83	292·03	Havelock of Darbalara
85	Silvermine 22nd of Banyule	Lyon and Kerr ..	Jersey ..	5,689	5·13	291·83	Audrey's Lord Twylish
86	Noorat Peach	Mrs A. Black ..	,, ..	5,568	5·22	290·88	Milklad of Banyule
87	Morven Daisy 7th ..	Kerr Bros. ..	Shorthorn	6,626	4·38	289·94	Morven York Rose 19th
88	Ruby of Tarnpirr .	D. C Miller ..	Jersey ..	5,703	5·08	289·78	Eminent V.C.
89	Wattle Bloom of Bellarie	W H. Atherton ..	,, ..	5,370	5·39	289·66	Lord Richmond
90	Lady Maid 2nd ..	C Lees ..	Ayrshire	6,275	4·60	288·92	Wallace of Roxburgh

HEIFERS—175 LBS. STANDARD—*continued*.

Order of Merit.	Name.	Owner.	Breed	Milk	Average Test	Butter Fat	Sire
				lbs		lbs.	
91	Burnbank Mercedes Violet	Flack and Sewell	Friesian	8,632	3·34	288·03	Dominion Gay Mercedes
92	Daisy 13th of Melrose	W. Woodmason	Jersey	5,377	5·34	287·37	Golden Fern's Viscount (imp.
93	Attraction of Tuernong	A. W. Findlay	,,	5,163	5·55	286·83	Island Butter King (imp.)
94	Alice of Comely Banks	W. and G. Finn	,,	5,731	5·00	286·73	Northwood Financier
95	Chevy 13th of Melrose	W. Woodmason	,,	5,263	5·42	284·99	Golden Fern's Viscount (imp
96	Mistletoe 3rd of Tarnpirr	A. Joshua	,,	4,826	5·88	283·56	Christmas Choice
97	Blanchette 5th of St Albans	A. W. Jones and Son	,,	5,483	5·17	283·29	Brighton King 8th
98	Queenie of Spring Vale	R. C. Campbell	,,	4,745	5·95	282·50	Comedy King of St. Albans
99	Bolobek Judith	O. J. Syme	Friesian	8,331	3·38	281·53	Rhoda Prince of Rubicon
100	Pansy of Gleneira	C. Lees	Ayrshire	6,508	4·32	281 27	Champion Triumph of Gleneira
101	Lizzie Birt of Kelburn	A. Robertson	Jersey	5,662	4·96	281·04	Noble Lad of Kelburn
102	Scotswood Mystic	A. H. Schier	Ayrshire	6,597	4·25	280·35	Warwick of Sparrovale
103	Flo of Ever Green	H. S Gibson	,,	6,161	4·54	279·87	Luminous of Drayton
104	Morven Daphne 14th	Kerr Bros.	Shorthorn	6,961	4·02	279·70	Morven York Rose 15th
105	Boree of Springhurst	J D. Read	Jersey	5,673	4·92	279·25	Attraction of Springhurst
106	Daisy 14th of Melrose	W. Woodmason	,,	4,651	5·99	278·56	Golden Fern's Viscount (imp)
107	Fern of Springhurst	J. D. Read	,,	5,039	5 51	277·69	Engineer
108	Hazel of Locheden	W. J McKernan	Ayrshire	5,946	4·65	277·65	Wily of Willow Vale
109	Tibeta	Department of Agriculture	Red Poll	6,446	4·30	277·59	Belligerent
110	Janet 2nd	Evans Bros.	,,	6,160	4·52	277·33	Dinkum Astrologer
111	Machree of Banyule	Lyon and Kerr	Jersey	4,577	6·05	276·80	Audrey's Lord Twylish
112	Lassie Fowler 9th of Melrose	W. Woodmason	,,	5,052	5·47	276·63	Golden Fern's Viscount (Imp.)
113	Daisy 2nd of Lake Valley	G. Vallence	Ayrshire	7,270	3·80	276·21	Sea Prince of Retreat
114	Trinket of Banyule	H. Luxton	Jersey	5,182	5·31	275·43	Audrey's Lord Twylish
115	St Alban's May Queen	A. W. Jones and Son	Friesian	7,864	3·50	275·19	Burdett's Prince
116	Annie 2nd of Medburn Grove	C. Bamford	Ayrshire	6,507	4·23	275·06	Lord Harry of Medburn Grove
117	Canary 4th of Lesterfield	P. Chirnside	Jersey	4,521	6·07	274·49	Quality 6th's Son of Melrose
118	Audrey's Lotus of Banyule	Lyon and Kerr	,,	5,392	5·09	274·36	Audrey's Lord Twylish
119	Hygeia of Sparrovale	Geelong Harbor Trust	Ayrshire	6,224	4·41	274·30	Luminous of Sparrovale
120	Janice of Sparrovale	Geelong Harbor Trust	,,	6,461	4·25	274·28	Jamie of Sparrovale
121	Carnation of Ferntree Vale	J. Phillips	Jersey	5,170	5·30	273·84	Jessie's Handsome Boy of Melrose
122	Springfield Nesta	A. W. Jones and Son	Friesian	8,496	3·22	273·17	Rosevale Inka Sylvia Posch
123	Maid 2nd of Linden	A. W. Jones and Son	Jersey	4,631	5·90	273·03	Chief of Linden
124	Velveteen 5th of Banyule	C. G. Lyon	,,	6,201	4·40	272·81	Milkmaid's Chief
125	Jessie 29th of Melrose	W. Woodmason	,,	4,632	5·89	272 61	Golden Fern's Viscount (imp)
126	Queenie 3rd of Willow Park	W. K. Atkinson	Shorthorn	6,788	4·01	272·50	Havelock of Darbalara
127	Pearl 10th of Melrose	W. Woodmason	Jersey	4,445	6·13	272 49	Golden Fern's Viscount (imp
128	Chevron	Department of Agriculture	Red Poll	6,562	4·15	272·01	Nicotine
129	Woorndoo	Warragul High School	,,	5,514	4·93	271 83	Belligerent (imp
130	Daisy of Ever Green	H. S. Gibson	Ayrshire	6,106	4·45	271·75	Chief of Sparrovale
131	Ashlyn 57	J. T. Tweddle	Friesian	7,667	3·53	270·59	Royal King Champion
132	Thora 9th of Banyule	Lyon and Kerr	Jersey	4,903	5·51	270·17	Audrey's Lord Twylish
133	Foregt-me-not of Retreat	W. J. Muhlebach	Ayrshire	5,789	4·66	269·06	Commonwealth of Retreat
134	Beltana	Department of Agriculture	Red Poll	6,534	4·11	268·66	Belligerent (imp)
135	Morning Star of Woorayl	Leongatha High School	Jersey	4,824	5·56	268·64	Shooting Star
136	Adella of Inverleigh	A. H. Schier	Ayrshire	6,341	4·22	267·31	Warwick of Sparrovale
137	Thora 11th of Banyule	C G. Lyon	Jersey	5,381	4·96	267·25	Milkmaid's Chief
138	Daphne	Leongatha High School	,,	5,653	4·71	267·11	Shooting Star
139	Lady Starbright of Bruce Vale	H. Luxton	,,	4,914	5·43	267·07	Island Butter King (imp)
140	Marise of Tarnpirr	E. A. Denis	,,	5,176	5·16	267·03	Eminent V.C.
141	Irish Flavour of Elouera	J. Scott	,,	4,911	5·43	266·54	Irishman
142	Ashlyn 58	Flack and Sewell	Friesian	6,103	4·36	266·03	Black and White King of Ashlyn
143	Noble's Morocco of Rainga	P. H. Lawrence	Jersey	5,752	4·62	265·75	Claribell's Noble 2nd
144	Canary of Tuerong	A. W. Findlay	,,	5,133	5·17	265·41	Quality's 6th Son of Melrose
145	Annie of Wattlebank	A. Kirby	Ayrshire	5,954	4·46	265·28	Weelfaird of Oakbank
146	Bareena Peace	Mrs. H. Lithgow	Red Poll	5,721	4·63	264·85	Belmont Grenadier
147	Foxglove 3rd of Tarnpirr	E. A. Denis	Jersey	4,595	5·76	264·75	Mythic's Choice of Tarnpirr
148	Maid 3rd of Linden	C. G. Lyon	,,	4,457	5·94	264·58	Chief of Linden
149	Peg of Colac	C. Wade	,,	5,348	4·95	264·51	Lassie's Fox of Colac
150	Daisy 9th of Jerseyholm	T. Harvey	,,	5,033	5·25	264·39	Emperor
151	Rosette of Springfield	J. W. Cochrane	Ayrshire	6,626	3·99	264 20	Goldfinder of Glen Alvie
152	Victoria Velvet	Department of Agriculture	Red Poll	6,134	4·30	263 73	Belligerent (imp)

HEIFERS—175 LBS. STANDARD—*continued*.

Order of Merit	Name	Owner	Breed	Milk	Average Test.	Butter Fat.	Sire
				lbs.		lbs.	
153	Ashlyn 52	J. T. Tweddle	Friesian	6,803	3·86	263·16	Royal King Champion
154	Clianthus of Springhurst	J. D. Read	Jersey	4,288	6·13	262·96	Arcadia's Choice
155	Dulcie of Ever Green	H. S. Gibson	Ayrshire	6,072	4·33	262·90	Luminous of Drayton
156	Miss Mac of Medburn Grove	C. Bamford	"	6,066	4·33	262·63	Macalister of Gowrie Park
157	Cosmos of Springhurst	J. D. Read	Jersey	4,228	6·19	261·74	Arcadia's Choice
158	Thanas' Madeira of Somerville	J. Hutchinson	"	4,834	5·39	260·55	Werribee Madeira Northwood King
159	Mollie Riley of Sparrovale	Geelong Harbor Trust	Ayrshire	5,718	4·55	260·31	The Laird of Sparrovale
160	Bertha of Medburn Grove	C. Bamford	"	5,840	4·45	259·91	St. Elfred of Willow Vale
161	Forget-me-not of Springhurst	J. D. Read	Jersey	4,159	6·25	259·77	Engineer
162	Pearlie of Hyde Park	J. Telford	Ayrshire	5,536	4·68	258·98	Elsdon of Willow Vale
163	Burnbank Queen Patch	Flack and Sewell	Friesian	6,783	3·82	258·90	Rock Patch
164	Fairy Queen 4th of Linden	A. W. Jones and Son	Jersey	5,189	4·98	258·49	The Chief of Linden
165	Pansy of Rosemont	R. H. Maher	"	4,826	5·33	257·09	Carrie's 5th Noble of Melrose
166	Burnbank Sylvia Posch	Flack and Sewell	Friesian	7,692	3·34	256·79	Rosevale Inka Burkegje
167	Princess of Willow Park	W. K. Atkinson	Shorthorn	7,054	3·63	256·10	Havelock of Darbalara
168	Rarity 13th of Melrose	E. A. Denis	Jersey	4,658	5·50	256·00	Golden Fern's Viscount
169	Countess 4th of Ashby	Dickinson Bros.	Friesian	7,830	3·27	255·93	Milkman Jo
170	Mabel of Sparrovale	Geelong Harbor Trust	Ayrshire	6,123	4·18	255·73	Romeo of Sparrovale
171	Alsyke 2nd of Springhurst	J. D. Read	Jersey	4,181	6·11	255·34	Arcadia's Choice
172	Daisy of Hyde Park	J. R. Telford	Ayrshire	6,232	4·09	255·16	Pride of Midbranch
173	Ashlyn 56	J. T. Tweddle	Friesian	6,565	3·87	253·78	Royal King Champion
174	Glady's Mac of Medburn Grove	C. Bamford	Ayrshire	5,776	4·39	253·54	Macallister of Medburn Grove
175	Rosobell of Elmsdale	G. Vallence	"	6,956	3·64	252·98	Majestic of Belle Vue
176	Princess of Woolamai Park	G. Kent	"	5,700	4·44	252·95	Beauty's Majestic of Gleneira
177	Morven Ruby 3rd	Kerr Bros.	Shorthorn	6,044	4·18	252·36	Emperor of Derrimut 4th
178	Cissie of Wattlebank	A. Kirby	Ayrshire	5,893	4·28	251·96	Weelfair'd of Oakbank
179	Aria	Department of Agriculture	Red Poll	6,024	4·18	251·54	Longford Major (imp.)
180	Blossom 5th of Melrose	W. Woodmason	Jersey	4,442	5·64	250·58	Golden Fern's Viscount (imp.)
181	Maud	S. Russell	Friesian	5,798	4·32	250·41	Tarrawarra
182	Jessie Fobes Homestead of Oakview	J. T. Tweddle	"	6,682	3·75	250·40	Dominion Dutch Lad
183	Countess 3rd of Ashby	G. A. Waite	"	7,731	3·23	250·00	Bolobek General
184	Bertha 2nd of Ellerslie	L. F. Armstrong	Ayrshire	5,932	4·21	249·52	Leila's Jamie of Ellerslie
185	Noble Guitar 2nd of Tinden	C. G. Lyon	Jersey	4,128	6·04	249·44	Annette's Chief of Linden
186	Ipomea of Springhurst	E. A. Denis	"	4,008	6·21	248·94	Arcadia's Choice
187	Gaiety Girl 11th of Melrose	A. Joshua	"	4,340	5·73	248·89	Latest Style of Melrose
188	Begonia of Ben Kell	R. Ralston	Ayrshire	5,951	4·17	248·35	Marvel of Willow Vale
189	Cream Nut of Glen Iris	C. D. Lloyd	Jersey	4,320	5·74	247·93	Perrees Duke
190	Morven Duchess 29th	Kerr Bros.	Shorthorn	6,335	3·91	247·45	Morven Weston Comet
191	Lady Elector 10th of Melrose	W. Woodmason	Jersey	4,092	6·03	246·81	Golden Fern's Viscount (imp.)
192	Burnbank Inka Sylvia Flower	Flack and Sewell	Friesian	5,916	4·17	246·50	Rosevale Inka Burkigje
193	Sybil	S. Russell	"	6,873	3·58	246·13	Tarrawarra
194	Rosette of Hillcrest	G. Rowe	Jersey	5,171	4·75	245·60	Bell Boy of Hillcrest
195	Beeswing of Medburn Grove	C. Bamford	Ayrshire	6,413	3·83	245·38	Lord Harry of Medburn Grove
196	Kyora Velveteen	Miss L. Robinson	Jersey	4,779	5·13	245·11	Daisy Morocco's Fox of Werribee
197	Jubilee Rosemary	Miss B. Reid	"	4,894	5·00	244·79	Poppy's King
198	Model of Kirkhill	D. C. Miller	"	4,417	5·53	244·12	Favourite's 4th Noble
199	Delphinium of Springhurst	J. D. Read	"	4,035	6·04	243·90	Arcadia's Choice
200	Bouvardia of Springhurst	J. D. Read	"	5,235	4·66	243·89	Attraction of Springhurst
201	Opal of Ben Kell	R. Ralston	Ayrshire	5,893	4·14	243·83	Marvel of Willow Vale
202	Morven Duchess of Brunswick 4th	Kerr Bros.	Shorthorn	6,169	3·93	243·74	Morven Weston Comet
203	Hope of Peri	J. Phillips	Jersey	4,952	4·90	242·86	Lily's 3rd Prince of Holmwood
204	St. Alban's Daisy	A. W. Jones and Son	Friesian	6,495	3·69	240·05	St. Alban's May King
205	Bonza of Medburn Grove	C. Bamford	Ayrshire	6,500	3·69	240·00	Douglas of Medburn Grove
206	Lady Grey 16th of St. Albans	H. Luxton	Jersey	4,079	5·88	239·88	Brighton King 8th
207	Princess of Ayr Brae	McFarlane Bros.	Ayrshire	4,492	5·34	239·86	Harmonist of Ellerslie
208	War Bird	Department of Agriculture	Red Poll	6,336	3·78	239·61	Belligerent (imp.)
209	Bardy of Winslade	Cockbill and Gibbs	Ayrshire	5,383	4·45	239·56	Blue Boy of Glengowrie
210	Bud of Sparrovale	Geelong Harbor Trust	"	4,380	5·46	239·08	The Laird of Sparrovale
211	Lady Hoyle 7th	Kerr Bros.	Shorthorn	6,451	3·69	237·82	Morven Weston Comet

HEIFERS—175 LBS. STANDARD.—*continued.*

Order of Merit	Name	Owner	Breed	Milk.	Average Test	Butter Fat	Sire.
				lbs.		lbs.	
212	Pearce's Heather	E T Pearce	Ayrshire	5,290	4·49	237·75	General of Gowrie Park
213	Victoria Bellona	Department of Agriculture	Friesian	6,438	3·69	237·54	Dominion Domino Dutch Boy
214	Irish Eyes of Elouera	J. Scott	Jersey	3,870	6·21	236·28	Irishman
215	Mermaid 2nd of St. Albans	A. W Jones and Son	„	4,285	5·50	235·85	Brighton King 8th
216	Bright of Woodbyrne	J. Benallack	Ayrshire	5,831	4·04	235·68	Pride of Warradale
217	Gertie 6th of Carracoorte	A. Kirby	„	5,764	4·08	235·16	Lord Dudley of Gowrie Park
218	Rosie of Cave Hill	J. Wills	Friesian	6,727	3·49	235·03	Bolobek Major
219	Semiramis 3rd of Kameruka	Lyon and Kerr	Jersey	4,642	5·05	234·83	Silver King
220	Lady Perfection of Midburn Grove	C. Bamford	Ayrshire	5,758	4·07	234·41	Percy of Medburn Grove
221	Daisy of Jersey Vale	Mrs. L. Orchard	Jersey	4,378	5·34	233·57	Choice 2nd of Tarnpirr
222	Kyora Twinkle	Mrs. L Robinson	„	4,714	4·95	233·15	Daisy's Morocco's Fox of Werribee
223	Belladonna of Aberdour	Alston Estate	„	4,457	5·20	231·82	Eminent V.C.
224	Daisy Brown of Inverleigh	A. H Schier	Ayrshire	5,194	4·45	230·97	Warwick of Sparrovale
225	Pixie of Langley Park	Callery Bros	„	6,371	3·61	229·91	Playaway of Willow Vale
226	Beenie of La Motte	S A Johnson	„	4,943	4·62	228·37	Bountiful's Eurobin of La Motte
227	Morven Ruby 5th	Kerr Bros	Shorthorn	5,820	3·91	227·37	Morven Weston Cornet
228	Rosebud of Langley Park	Callery Bros.	Ayrshire	5,614	4·04	227·23	Playaway of Willow Vale
229	Bonnie Annie of Aberdour	Alston Estate	Jersey	4,178	5·43	226·78	Eminent V C.
230	Pauline 2nd of Ashby	G A Waite	Friesian	6,755	3·35	226·14	St. Alban's May King
231	Cora of Hyde Park	J R Telford	Ayrshire	4,480	5·05	226·06	Modesty's Implex of Glencairn
232	Burnbank Domino Patch	Flack and Sewell	Friesian	6,862	3·28	224·91	Rock Patch
233	Woodbyrne Tartar	T H Payne	Red Poll	4,889	4·60	224·91	Honingham Astrologie (Imp)
234	Fun of Medburn Grove	C Bamford	Ayrshire	5,916	3·80	224·59	Percy of Medburn Grove
235	Gold Point 2nd of Banyule	A H. Schier	„	4,730	4·74	224·38	Rational of Oakbank
236	Dainty of Glencourt	H. J. Munro	„	5,451	4·11	223·80	Lennox of Dunachton
237	Beauty of Staghorn	F Bidgood	Jersey	4,231	5·20	222·77	Werribee's Fancy Butter King
238	Phyllis of Woodbyrne	J Benallack	Ayrshire	5,126	4·34	222·46	Merry Boy of Woodbyrne
239	Pearl Red 28th	F G. Sadler	Shorthorn	5,476	4·06	222·16	Earl of Pentland 43rd
240	Melba of Hillcrest	A Joshua	Jersey	4,732	4·67	221·06	Bell Boy of Hillcrest
241	Halecote Joan de Kol	G. A. Waite	Friesian	5,903	3·74	220·71	Victoria Milkman Jo
242	Melba of Holly Green	H L. Webb	Ayrshire	4,969	4·43	220·23	Maxwell of Gleneira
243	Fancy of Wattle Bank	A. Kirby	„	4,893	4·50	220·16	Weelfair'd
244	Fuchsia of Medburn Grove	C Bamford	„	5,047	4·34	219·82	Lord Harry of Medburn Grove
245	Vanilla 16th of Melrose	W Woodmason	Jersey	3,603	6·08	218·98	Golden Fern's Viscount
246	Burnbank Inka Segis Maggie	Flack and Sewell	Friesian	6,753	3·24	218·69	Alderly Segis Beets
247	Rita 4th of Linden	F W. Beischer	Jersey	4,007	5·39	215·97	Queen's Chief of Linden
248	Queen of Scots 2nd of Banyule	A H. Schier	Ayrshire	4,628	4·66	215·78	Rational of Oakbank
249	Graceful Duchess 23rd of Melrose	W. Woodmason	Jersey	3,649	5·91	215·55	Reveller of Melrose
250	Sunflower of Tarnpirr	Alston Estate	„	4,105	5·25	215·49	My Queen's Choice of Tarnpirr
251	Defender's Queen of Somerset	A E. Batson	„	4,405	4·89	215·23	Lord Silvermine 8th of Banyule
252	Empire 8th of Melrose	C Falkenberg	„	4,107	5·24	215·14	Golden Fern's Viscount (imp)
253	Pearl of Gleneira	C Lees	Ayrshire	4,848	4·43	214·64	Sunstar of Lady Bank
254	Beauty 2nd of Belgonia	E. A. Denis	Jersey	3,968	5·40	214·07	Hedge of Banyule
255	Mona of Wethersdane	Cockbill and Gibbs	Ayrshire	4,934	4·33	213·46	His Majesty of Wethersdane
256	Happy Jean of Medburn Grove	C Bamford	„	4,451	4·79	213·27	Doctor of Medburn Grove
257	Bettsie of Inverleigh	A. H Schier	„	4,685	4·55	213·16	Warwick of Sparrovale
258	Princess of Strathbow	F Raggatt	Jersey	4,444	4·79	212·92	Bonnie Lad of Kings Vale
259	Veronica of Dunachton	R Hall	Ayrshire	5,453	3·90	212·74	Juan of Oakbank
260	Rose of Hillcrest	M. and W A. Francis	„	4,592	4·59	210·79	Victor of Warrook
261	Patricia of Kilmarnock	Sadler Bros.	„	5,550	3·80	210·67	Laura's Laird of Gowrie Park
262	Carolina	Mrs. M. E. Carroll	Red Poll	4,873	4·30	209·73	Highflyer
263	Cissie of Willow Vale	R Ralston	Ayrshire	5,521	3·80	209·66	Gain of Oakbank
264	Favorite 2nd of Staghorn	F. Bidgood	Jersey	4,494	4·65	209·17	Daisy's Fox 2nd
265	Flowing Vale Coney	R. E. Dent	Red Poll	4,396	4·77	208·31	Redmond
266	Mill Brown Duchess	Miss L. Robinson	Jersey	3,951	5·27	208·25	Brown Duke of Glen Iris
267	Fairy Queen of Langley Park	Callery Bros.	Ayrshire	4,812	4·32	208·05	May King of Langley Park
268	Viola 2nd of Carracoorte	W. Henderson	„	4,744	4·36	206·95	Lord Dudley of Gowrie Park
269	Flower of Bignold	S Earle	Jersey	4,257	4·83	205·91	Jolly Mike of Fairview
270	Joy of Hillcrest	G. Rowe	„	3,741	5·49	205·41	Bell Boy of Hillcrest
271	Princess 2nd of Willow Park	W. K. Atkinson	Shorthorn	5,117	4·01	205·37	Havelock of Darbalara

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit	Name	Owner	Breed	Milk	Average Test	Butter Fat	Sire
				lbs		lbs	
272	Oatland's Maggie	J Thorburn	Ayrshire	4,615	4·44	205·14	Malster of Seafield
273	Blossom of Wethersdane	Cockbill and Gibbs	"	5,140	3·98	204·33	His Majesty of Wethersdane
274	Lady Golden of Brucedale	A Joshua	Jersey	3,610	5·65	204·15	Island Butter King (imp)
275	Gaiety of Roxburgh	T Douglas	Ayrshire	5,512	3·69	203·75	Good Lad of Roxburgh
276	Countess of Carracoorte	W. Henderson	"	4,350	4·67	203·34	Lord Dudley of Gowrie Park
277	Lady of Elmsdale	G. Vallence	"	5,109	3·98	203·19	Majestic of Bell Vue
278	Moonlight of Medburn Grove	C. Bamford	"	5,030	4·03	202·71	Lord Harry of Medburn Grove
279	Profit of Roxburgh	A. H Schier	"	5,604	3·61	202·24	Good Lad of Roxburgh
280	Nancy 2nd of Somerset	A. E. Batson	Jersey	3,157	6·40	202·09	Lord Silvermine 8th of Banyule
281	Marguerite 2nd of the Valley	G. Vallence	Ayrshire	4,787	4·19	200·71	Sea Prince of Retreat
282	Three Castles	Department of Agriculture	Red Poll	4,677	4·27	199·91	Longford Major (imp.)
283	Neatest of Springvale	R C Campbell	Jersey	4,422	4·52	199·87	Comedy King of St. Albans
284	Duchess of Darley 2nd	R. G Mortor	Shorthorn	5,384	3·70	199·02	Morven Charming Duke 3rd
285	Duke's Spark of Glen Ira	S. S. Cameron	Jersey	3,141	6·33	198·97	Perrees Duke
286	Rose of Jersey Vale	Mrs L. Orchard	"	4,026	4·91	197·86	Golden Twylish
287	Halecote Ariadne	G. A Waite	Friesian	5,350	3·69	197·60	Marquis of Edam
288	Merline of Inverleigh	A. H. Schier	Ayrshire	4,352	4·51	196·45	Major of Gowrie Park
289	Battle Smoke	Department of Agriculture	Red Poll	4,727	4·15	196·06	Belligerent (imp.)
290	Lady Doris of Ben Kell	R. Ralston	Ayrshire	4,638	4·22	195·63	Marvel of Willow Vale
291	Tragedy 3rd of Linden	H. Luxton	Jersey	3,631	5·37	195·23	Annetta's Chief of Linden
292	Oatland's Beauty	J Thorburn	Ayrshire	4,147	4·71	195·13	Malster of Seafield
293	Carlyle Grace Pietertje	J F. Williams	Friesian	6,464	3·00	193·97	Aberkerk Marquis of Sunnycroft
294	Morven	Evans Bros	Red Poll	5,025	3·85	193·65	Dinkum Astrologer
295	Ina of Ben Kell	C. Lees	Ayrshire	4,498	4·30	193·49	Marvel of Willow Vale
296	Canary of Rocklee	Mrs. F. M Akhurst	Jersey	3,599	5·36	192·79	Bonnie Lad of Kings Vale
297	Limerick	Mrs. M. E. Carroll	Red Poll	4,858	4·00	192·69	Highflyer
298	Bud of Ayr Brae	McFarlane Bros	Ayrshire	4,669	4·11	191·79	Harmonist of Ellerslie
299	Ashlyn 63rd	S. S. Cameron	Friesian	5,681	3·36	191·15	Royal King Champion
300	Madge of Langley Park	Callery Bros	Ayrshire	4,490	4·24	190·21	Gallant Lad of View Hill
301	Pansy of Hillcrest	F. G. Sadler	Shorthorn	4,454	4·26	189·95	Morven Charming Duke 6th
302	Little Maid	G. Rowe	Jersey	4,537	4·18	189·73	War Chief
303	Carlisle Netherland Grace	J. T Tweddle	Friesian	4,683	4·05	189·73	Dominion Sir Agnes
304	Effie of Langley Park	Callery Bros.	Ayrshire	4,638	4·83	189·37	Playaway of Willow Vale
305	Leila of Hillcrest	M. and W. A. Francis	"	4,339	4·36	189·02	Victor of Warrook
306	Holly of Sparrovale	Geelong Harbor Trust	"	5,446	3·47	188·95	Romeo of Sparrovale
307	Belle of Wethersdane	Cockbill and Gibbs	"	4,775	3·94	188·32	His Majesty of Wethersdane
308	Virtue of Ayr Brae	McFarlane Bros.	"	4,315	4·35	187·73	Kiltie of Oakbank
309	Lady of Ayr Brae	McFarlane Bros.	"	4,490	4·18	187·62	Harmonist of Ellerslie
310	Buttercup of Jersey Vale	Mrs. L Orchard	Jersey	3,767	4·98	187·47	Choice 2nd of Tarnpirr
311	Olive of Riccarton	W. T. Cullen	Ayrshire	4,493	4·15	186·35	Royal King of Glen Avon
312	Molly of Woodbyrne	J. Benallack	"	4,684	3·98	186·19	Pride of Warradale
313	Zeta of Sunnyside	A. H. Schier	"	4,369	4·25	185·68	Bernie of Oakbank
314	Bolobek Dorothea	O. J. Syme	Friesian	4,870	3·80	184·82	Indulge Johanna Lad
315	Adele of Cororooke House	J. Benallack	Ayrshire	4,549	4·05	184·21	Eclipse of Gleneira
316	Iris of Raith	C. G. Newton	"	4,761	3·65	183·55	Treasure of Raith
317	Daphne of Mt. Hope	M. Galbraith	"	4,472	4·10	183·32	Stella's Prince of Gowrie Park
318	Cherry 2nd of Willow Park	W. K. Atkinson	Shorthorn	4,304	4·25	182·83	Havelock of Darbalara
319	Bernice of La Motte	S A Johnson	Ayrshire	3,594	5·08	182·48	Stewart of Gowrie Park
320	Dora of Netherbrae	C L Rigby	"	5,577	3·27	182·34	Hilda's Earl of Gleneira
321	Burnbank Springfield Inka Fayne	Flack and Sewell	Friesian	5,619	3·06	181·83	Springfield Inka
322	Rhea Read 2nd of Clematis	C. J Reid	Jersey	3,564	5·08	180·99	Ingot of Banyule
323	Effrontery	Department of Agriculture	Red Poll	4,076	4·67	180·58	Highflyer
324	Doris 2nd of Fairfield Park	C. L Rigby	Ayrshire	5,310	3·40	180·30	Hilda's Earl of Gleneira
325	Dolores 2nd of Banyule	A. H. Schier	"	3,892	4·62	179·71	Rational of Oakbank
326	Noorat Mignonette	Mrs. A. Black	Jersey	3,587	5·01	179·68	Milklad of Banyule
327	Snowy 2nd of Mt. View	Cockbill and Gibbs	Ayrshire	4,842	3·71	179·54	Braw Baron of Glengowrie
328	Betsey 6th of Carracoorte	W. Henderson	"	4,041	4·42	178·81	Lord Dudley of Gowrie Park
329	Burnbank Mercedes Flower	Flack and Sewell	Friesian	4,515	3·95	178·18	Gay Mercedes
330	Oatland's Bright Beauty	J. H. Thorburn	Ayrshire	4,228	4·16	175·76	Captain of Medburn Grove

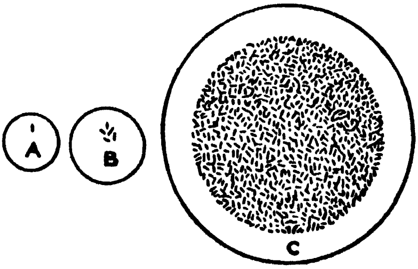
COOL THE CREAM

AND MAKE CHOICEST BUTTER.

By R. T. Archer, Senior Dairy Inspector.

Owing to the improved methods of management in butter factories in the State, and the keen competition which has consequently followed, second-grade butter is becoming less and less saleable. The result is that farmers who supply second-grade cream will find their returns growing smaller and smaller, for factory managers will accept inferior cream only at a price much below that given for the choicest first grade. It therefore becomes imperative for the farmer to supply only the best, and he must leave no stone unturned in order to achieve this result.

Milk when drawn from a healthy udder is always "choicest," and cream obtained therefrom should be of similar quality. If it is not, and is below "choicest" grade, it is due to contamination over which the farmer has control.



A Represents a single microbe ;
B Its progeny after twenty-four hours in cream cooled ;
C Its progeny after twenty-four hours in cream not cooled.

Bacteria, or germs, are freely distributed in nature, and readily gain access to milk carelessly handled and find there a medium adapted to their development. The growth of these organisms is so rapid that at body temperature they double themselves every twenty minutes, so that within 24 hours one germ may develop into millions. The propagation of bacteria in cream, however, can be checked, and the simplest way to do this is to cool the cream as it leaves the separator. The lower the temperature attained at this stage, the smaller is germ development.

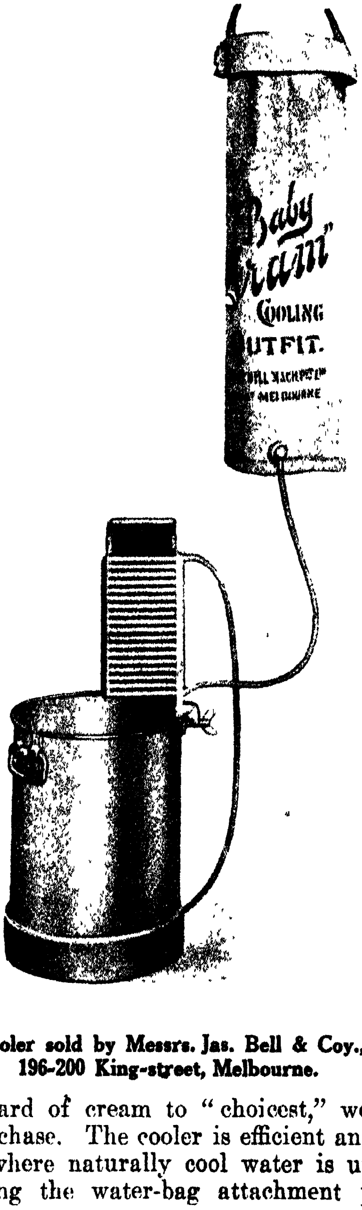
Clean and Cool.

"Clean and Cool" should be the dairyman's motto.

Clean hands should milk clean udders under clean conditions into clean buckets and the milk should be put through a clean separator.

The last-mentioned requirement is probably the most important point for securing cleanliness. A separator retains a large proportion of the dirt, &c., which inevitably gains access to milk; the machine thus acts as a purifier. If this dirt be not thoroughly removed after each operation, the subsequent milk passing through the separator will certainly be seriously contaminated and become at once of second and even lower grade. Therefore it is essential that the separator should be cleaned immediately after each separation.

The next step is to cool the cream in order to prevent growth of organisms. On the dairy farm, this can best be accomplished as the cream leaves the separator. Herein are illustrations of suitable coolers, obtainable at rates within the reach of every farmer, any one of which by lifting the standard of cream to "choicest," would pay for itself within a week of purchase. The cooler is efficient and easy to clean and handle. In places where naturally cool water is unobtainable, it can be provided by using the water-bag attachment provided with the cooler.

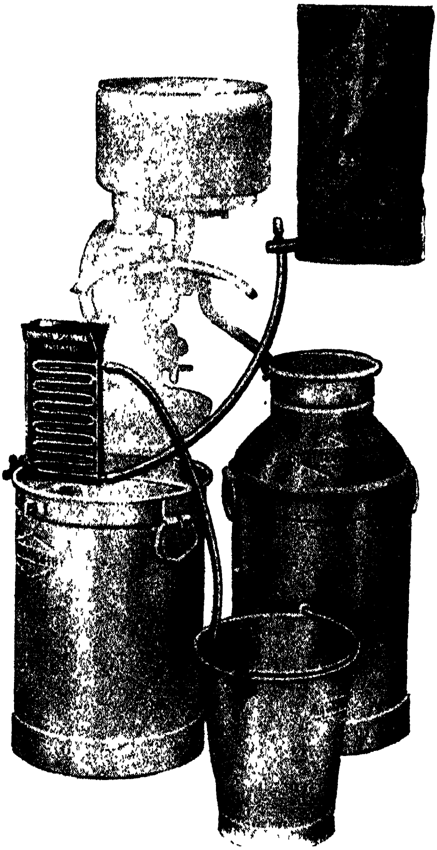


Cooler sold by Messrs. Jas. Bell & Coy., 196-200 King-street, Melbourne.

In hot districts or where there is not daily delivery, the cream must be kept cool; a cheap and satisfactory means is at hand in the Coolgardie safe.

In the interest of the State as a whole, and particularly in the interest of every dairy farmer, it should be made compulsory under the Dairy Produce Act for all cream to be cooled on the farm, and regulations to that effect are likely to be made in the near future.

Dairy Farmers, Get a Cooler!



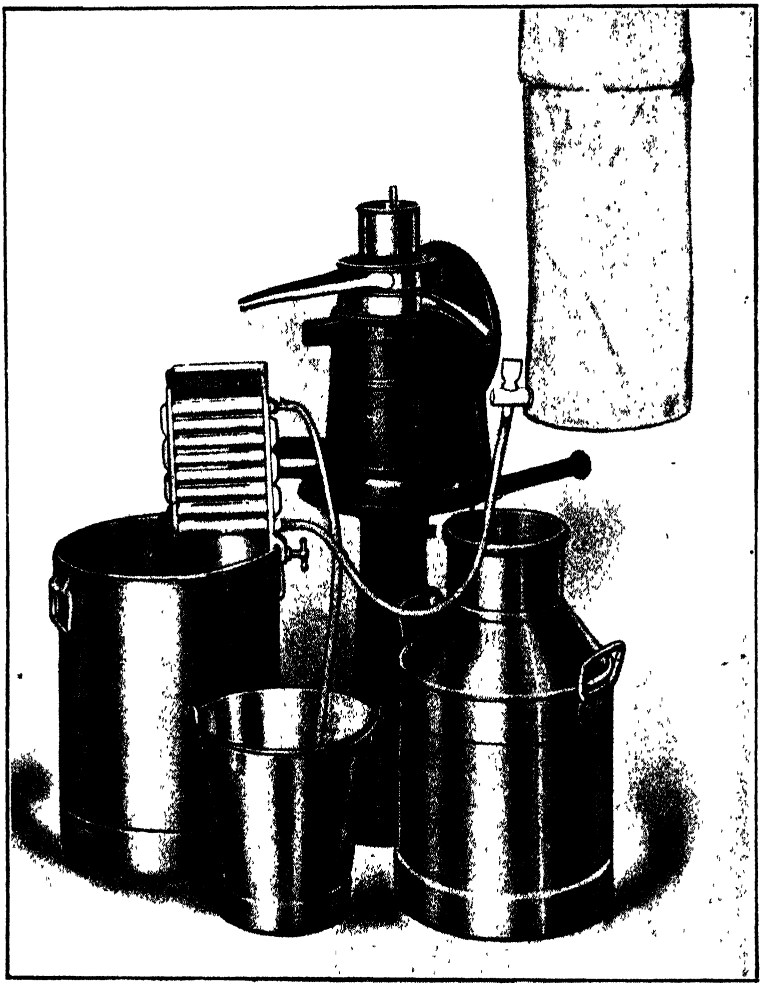
Cooler sold by Messrs. Mayne & Holbery, 232 King-street, Melbourne.

HOW TO MAKE A COOLGARDIE SAFE.

What is known as a Coolgardie safe can be made at a little cost with a few battens, some hessian, and sufficient galvanized iron to make a shallow dish.

The principle of the safe is the same as occurs in the canvas water bag which, as is well known, keeps the contained water at a much lower temperature than the surrounding atmosphere by virtue of the evaporation taking place. With this safe, water is syphoned from a basin on the top—by means of strands of wool; this flows over the hessian lining, keeping it continually moist and the contents cool and fresh.

Such a safe will prove a boon to the women folk during the summer months as a storage place for meat, butter, milk, and other perishable products. As it is not wise to store anything else in the same safe with the cream, it would be advisable to make two—one for cream storage and one for other foodstuffs.

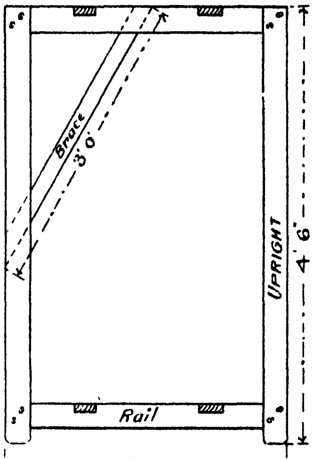


Cooler sold by H. Hunt Pty. Ltd., 27 William-street, Melbourne.

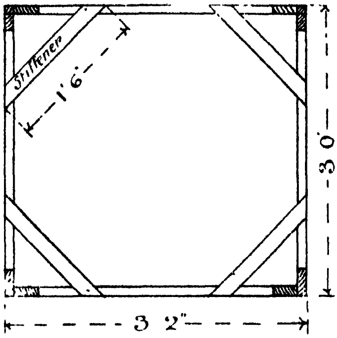
The timber required is 3-in. x 1-in. uprights and rails, and 2-in. x 1-in. braces.

Each side consists of two uprights 4 ft. 6 in. long, two rails 3 feet long, and one brace 3 feet long. The brace for framework of front in which the door is hung will be only 18 inches long, and will act as a stop to the door.

The uprights and rails are framed together as shown in drawing No. 1; the joints are halved together and screwed with two screws to each joint, and the brace is firmly screwed on the back.



No 1



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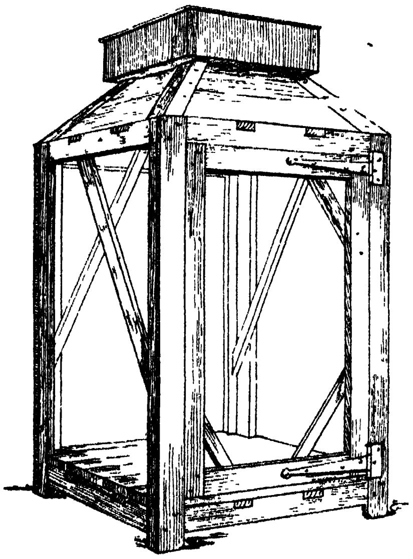


No 3

The four sides having been made are placed together, forming a square 3 feet x 3 ft. 2 in., as shown in drawing No. 2; the sides are nailed together at the corners, and each corner is stiffened at top and bottom by a brace, 1 ft. 6 in. long, let flush into top of rails and nailed thereto with 2-in. nails.

The floor is formed with 6-in. x ¾-in. tongued and grooved boards nailed on top of rails with 2-in. nails.

The top should be made, as shown in drawing No. 3, of 6-in. x ¾-in. wood. The sloping sides are supported on eight triangular pieces 1½ inch thick, well nailed to top of rails and stiffeners. In order to save the labour of carefully mitreing the angles so as to keep the water out of the safe, it will be necessary to cover the joints with a strip of galvanized iron.

The door should be constructed in the same manner as the sides, but with two short braces, as shown in drawing No. 3, to be hung on a pair of 12-in. T hinges and fitted with turn button or other fastener.

In order to catch the drip when the door is opened, a small gutter, made of light galvanized iron, should be hung on galvanized iron staples to inside of top rail of front. It should be so hung that when the door is opened the gutter will swing forward sufficiently to catch any drips; in closing, the door should push the gutter back.

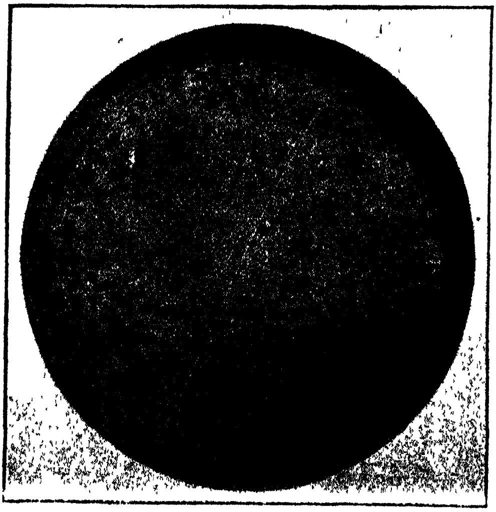
A small gutter made of galvanized iron should be fixed with galvanized iron clouts to outside of bottom rails, with a fall to the corner most convenient for running the water off.

The basin on top may be any watertight vessel, into which strands of wool are placed to syphon the water out on to the hessian.

The drawings, for the sake of clearness, show the framework without any covering. All the framework is to be covered externally with hessian fixed with copper tacks to rails and uprights.

GET RID OF FLIES.

The possible damage that flies can do to food can be understood by considering the organisms left by a single fly in its track. The illustration hereunder shows a plate of gelatine over which a fly has walked. Each dot is a colony of germs which has grown wherever the feet of the insect have touched. The contamination which results from a fly falling into milk can be imagined.



EGG-LAYING COMPETITION, 1923-24.

Results of Winter Test at Burnley.

By W. C. Rugg, Chief Poultry Expert.

The poultry breeders, who have sent birds to compete at Burnley this year, are to be congratulated on the general improvement in the size of the eggs laids by their birds.

In the winter test of 122 days which terminated on 31st July, every egg laid weighed two ounces or over, consequently not one bird was disqualified for under-weight eggs.

The weather during the test was very much against high egg production. The long dry spell broke towards the end of May into wet, cold, and windy conditions, and some bad storms coming from ! east drove the rain right into the back of the pens. The Curate states that the weather during June and July was the worst experienced at Burnley for years. Taking this into consideration, the scores of the leading birds must be considered highly satisfactory. Each of fifteen in the heavy breeds and three white Leghorns each laid 100 eggs or over during the four months.

For size, type, and quality, some of the competitors are equal, if not better, than birds entered at previous competitions; but in all sections there is still room for considerable improvement. There are a number of men experienced in laying competitions who need no advice from me, but I would strongly advise other breeders who contemplate entering at future Burnley competitions of the necessity for careful selection of their breeding stock. Only the progeny of birds of good type and strong constitution should be entered. The eggs used for hatching should weigh two ounces or over, and when the chickens hatch they should be given every chance to grow and develop by having as much liberty as possible, with frequent shifting on to fresh ground They should be liberally fed from the time of hatching, with the object of expanding their crops to enable them to consume large quantities of food. It will be too late to do it when they are half grown, and it is the heavy feeder that is the fast layer.

Only the plainest of food should be used, as the Department's object is to feed only such foodstuffs at the competition as are easily obtained by any poultry breeder in any part of the State, viz : Bran, pollard, boiled livers, wheat, oats, maize and chaffed green stuff.

In selecting pullets for the competition, about twenty of the best-developed, as equal in size, type, and age as possible, should be picked. Six weeks or so before the competition they should be placed by themselves. If the owner wants to be in the first flight, every detail must be closely observed from week to week till a final selection can be made If possible those selected should be of the same strain and from one mating, as in the event of a team reaching a high position in the test, they would then be more valuable for breeding purposes, and a much better advertisement for their owner.

The test for teams at Burnley is the most severe in the State, and it speaks volumes for the ability of the breeders that they can rear birds capable of laying such large quantities of eggs when exposed to all weathers in open yards and fed on the plainest of foodstuffs. A bird of poor type and constitution will sometimes lay a large number of eggs under the sheltered conditions of a single-pen shed, but it takes a team with really good stamina and constitution to win a twelve months' team test at Burnley.

In looking over the teams it is evident that some breeders have been unfortunate in selecting their birds, as several fair teams have been spoilt by the inclusion of one or more members that should never have been at a competition. These breeders must remember that visitors to Burnley are apt to come to the conclusion that the competing birds represent the quality of the owner's stud birds. Every care should be exercised, therefore, to send only birds that are well up to standard.

In Section A, Class 1, pens 7, 15 and 21 are not good competition birds, and, in one case I know, they are not a true sample of that owner's stud stock. Pens 5, 11, 14 and 16 are good even teams, and of the type desired at the competition.

In Class 2, the birds in pen 25 may lay a lot of eggs, but are too uneven. Pen 27 is probably as good as anything in the competition, and its members, with those of pens 30 and 32, are good samples of the quality desired.

In Class 3, the contestants in pen 38 are very uneven, while those of pen 37 are a good strong team, with plenty of size. Those in pen 45 are a good even, tight-feathered team, and at present look as if they will lay a lot of eggs

In Class 4, pens 60 and 61 are very poor teams. The birds in pen 62 (Langshans) are of very even quality, and are laying well.

PRIZE WINNERS.

Section A.—Groups of Six Birds—Trap-nested.

Name and Address of Competitor.	Pen No.	Bird No	No. of Eggs	Breed
Light Breeds.				
Six Birds—				
1st Prize, Champion Certificate— D. Gibson, 126 Dundas-street, Thornbury	14	..	516	White Leghorns
2nd Prize, Government Certificate— Herbert Bros., Diamond Creek ..	16	..	455	White Leghorns
Individual Birds—				
1st Prize Champion Certificate— Oreps Poultry Farm (C. O. Dunn), Moorabbin-road, Cheltenham ..	7	1	97	White Leghorn
2nd Prize, Government Certificate— D. Gibson, 126 Dundas-street, Thornbury	14	4	95	White Leghorn

SECTION A.—GROUPS OF SIX BIRDS—TRAP-NESTED—*continued.*

Name and Address of Competitor	Pen No	Bird No	No. of Eggs	Breed
Heavy Breeds.				
Six Birds—				
1st Prize, Champion Certificate— J. Wear, Werribee	42	..	528	Black Orpingtons
2nd Prize, Government Certificate— Herbert Bros., Diamond Creek ..	45	..	501	Black Orpingtons
Individual Birds—				
1st Prize, Champion Certificate— J. Wear, Werribee	42	3	102	Black Orpington
2nd Prize, Government Certificate Herbert Bros., Diamond Creek .	* 45 45	1 4	101 101	Black Orpington

Section B.—Individual Birds.

Name and Address.	Pen. No.	No. of Eggs	Breed.
Light Breeds.			
1st Prize, Champion Certificate— H. W. Smith, Ethel-street, Preston .. .	108	105	White Leghorn
2nd Prize, Government Certificate— J. J. West, 3 Christmas-street, Northcote ..	113	102	White Leghorn
Heavy Breeds.			
1st Prize, Champion Certificate— W. Cullen, Closer Settlement, Werribee ..	33	113	Black Orpington
2nd Prize, Government Certificate— T. L. Eastaugh, Point Nepean-road, Moorabbin	76	112	Black Orpington

Equal for second place.

POULTRY NOTES, RESEARCH FARM, WERRIBEE.

W. O. Pederick, Poultry Foreman.

Breeding operations have been very successful. Fertility has been good throughout the season, and the percentage of chickens satisfactory. Nearly 2,000 have been hatched to date. All weak and ailing chickens are destroyed. The incubators are still full, but hatching operations will not be finished until the beginning of October.

The July chickens will soon be ready to be transferred to the colony houses, and will then be given free range

Owing to the bountiful rains there is a splendid growth of green-stuff, and the young birds should do exceptionally well.

Great care has to be exercised when shifting chickens from the brooder-house to other quarters, as they are apt to crowd and smother, but by the use of wire-netting floors in the colony houses this danger has been reduced to a minimum. The chickens in the houses will be frequently moved on to fresh ground to induce them to take as much exercise as possible, and they will be liberally fed on plain food. When just on the point of laying they will be transferred to the laying sheds.

Egg production has been good. The Leghorns are laying a little faster than the Orpingtons. A number of settlers have been supplied with eggs for hatching purposes, and from reports to hand satisfactory results have been obtained from them.

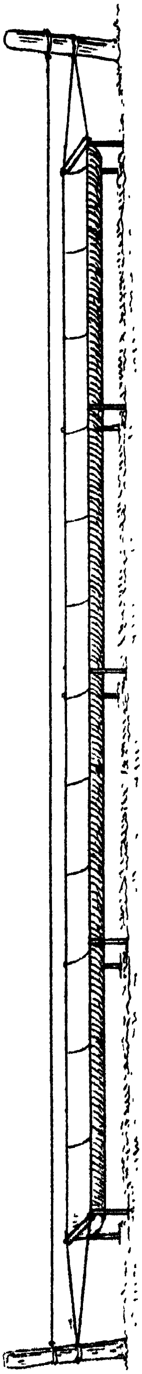
It is necessary to be continually on the watch for vermin at this time of the year, and to take measures to exterminate them by giving the birds access to a good dust bath. Any individual bird badly infested should be dusted with a good vermin powder. The perches should be painted with kerosene.

As the warm weather advances a larger quantity of green-stuff will be added to the morning mash, and the birds kept for egg production only will be given chaffed green stuff after their grain feed at night.

FATTENING SHEEP ON CRUSHED OATS AND CHAFF.

A. J. Gill, Dairy Supervisor.

An interesting experiment of marketing produce on the hoof was lately carried out by Mr. H. L. Webb, "Holly Green," Sunbury. Mr. Webb has held the opinion for some time that it would pay handsomely to fatten sheep on oats and chaff, and, in order to test his theory, about the middle of December last he purchased some weaners in low condition. They were from Lincoln merino ewes by Shropshire rams, and cost 8s. per head.



Trough for Feeding Sheep.

As Mr. Webb wished to obtain four cuttings of lucerne from his paddock, the weaners were turned into hilly country until the middle of April, when, owing to drought conditions, they were still in low condition. They were then grazed in an 18-acre paddock of lucerne, which showed a growth of about 4 inches, but in three weeks' time it was apparently eaten out.

A trough 36 feet in length was placed in the centre of the paddock. It was made from twelve cornsacks sewn end to end, and fencing wire was threaded lengthways along each side of the bag and strained between two posts about 43 feet apart; a piece of 3-inch by 1-inch wood about 16 inches long was used as a spreader between the wires at each end of the bagging; this allowed a drop of from 5 to 6 inches in the centre of the trough. Upright supports were placed about every 9 feet along the wires to prevent sagging and keep the edges of the trough 14 inches from the ground. A wire was strained 6 inches above the centre to prevent the sheep from jumping over. Such a trough gives ample space to feed 60 small sheep or 50 large ones.

The weaners were fed on crushed oats, lucerne, and oaten hay chaff. The quantity allowed per sheep and the composition of the daily feed was as under:—

First week—½ lb. crushed oats, ½ lb. chaff (oaten and lucerne).
Second week—½ lb. crushed oats, 1 lb. chaff (oaten and lucerne).
Third week—¾ lb. crushed oats, 1 lb. chaff (oaten and lucerne).
Fourth week—1 lb. crushed oats, 1 lb. chaff (oaten and lucerne).
Fifth week.—1 lb. crushed oats, 1 lb. chaff (oaten and lucerne).

During the fourth week the amount of chaff was increased to 2 lbs., but as the trough was not being cleared out, the old allowance was immediately reverted to.

Hand-feeding commenced on the 16th April, 1923, and the sheep were sold on the 22nd May following at Newmarket yards for £1 18s. 11d. per head—very close to the top price for the day. The auctioneer's report described them as being of beautiful quality. When the feeding commenced, the weaners were, to use Mr. Webb's term, razor-backs, with a probable dressed weight of about 25 lbs.; when sold the estimated weight was 45 lbs—a gain of 20 lbs., or 4 lbs. a week. Reckoning mutton as worth 10d.

per lb., the value of the increased weight put on by a sheep in five weeks was 16s. 8d. The cost of fattening and amount of food used was—

	s.	d.	
Lucerne and oaten hay chaff—31½ lbs. ..	2	0	per sheep
Crushed oats—26¼ lbs.	2	6	per sheep
Amount allowed for grazing	1	3	per sheep
Total cost	5	9	per sheep

These weaners were unshorn when purchased. They had cut 3s. worth of wool per head. Being shorn late, the skins were not as valuable as they would have been if shorn earlier.

Mr. Webb is of the opinion that he can fatten a full-sized sheep on 1 bushel of oats with the addition of lucerne and oaten hay chaff. Further experiments are being carried out, and the sheep are weighed weekly in the presence of a Departmental official.

PERFORMANCE AND PEDIGREE.

So convinced is the Danish Government of the value of performance as distinct from pedigree, says a recent issue of the *Journal of the Ministry of Agriculture* (London), that in making provision for the award of special prizes for bulls, it was laid down that a bull is not eligible for a Government prize unless records of the performances of his daughters can be produced. The journal quotes the informative statement that before inauguration of milk-recording societies it had already become a general practice to keep bulls for service for a number of years and to judge the bulls by an examination of their offspring.

The practice of neglecting to milk cows for from twelve to twenty-four hours before showing cannot be too strongly condemned. It is foolish because the efficient judge is not deceived by an udder distended in this manner. He must determine the quality of the udder, and this is best done in the case of the cow which has been milked at the regular milking time.

MOSKONFYT.

A NEW GRAPE PRODUCT.

In view of the reduced prices now offering for "Dorodilloes," and some other grapes, a new grape product is worthy of attention.

In the *Journal* of the South African Department of Agriculture of 23rd April last, Mr. S. W. Van Niekerk, Government Viticulturist, contributes an article, the following extracts from which should prove of interest to vinegrowers:—

The name "moskonfyt" is used for a syrup made from pure grape-juice. The writer did not succeed in finding any historical documents on moskonfyt, but, according to information from old inhabitants, moskonfyt has been known in South Africa practically as long as the grape-vine itself. It is an old custom with wine farmers to make a certain quantity of moskonfyt every year for home consumption, and perhaps some more for a few friends, but seldom with the object of marketing the syrup or konfyt.

The following is a brief summary of the manner in which moskonfyt is made on the farm:—Towards evening the must of grapes, which were pressed the same day, is drawn from the skins into a tub, where it settles more or less during the night. Next morning from six to eight bucketfuls of the fairly clear must are poured into a copper or iron pot, and boiled. As soon as the pot gets heated, the must starts forming scum; all the scum is then carefully removed with a scummer. The must should be continuously stirred with a scummer, or a forked bamboo stick to prevent it from boiling over. After boiling for about three or four hours a syrup is obtained, known as moskonfyt. Farmers have different methods for determining the exact moment when the moskonfyt is ready, *i.e.*, when the required sugar concentration is reached. The most general method is to pour a little of the boiling syrup when it is nearly ready on to a plate, allow it to cool quickly, and then determine if it has been concentrated sufficiently. Needless to say this method is very inaccurate, and often gives disappointing results. It is a well-known fact that when moskonfyt is not sufficiently concentrated, it will start fermenting later on and turn bad, and if over-concentrated the syrup will wholly or partially crystallize. Where moskonfyt is boiled in an open pot, it usually has a particularly pleasant taste, which cannot be obtained when concentrated in a vacuum apparatus. Sometimes the boilers improve the taste artificially, by specially flavouring the moskonfyt by adding naartje parings, fig leaves, or even spices, such as cloves, cinnamon, &c. It should also be mentioned that, in later years, a certain amount of lime is being used to settle the must before boiling. Most farmers were not aware of the fact, however, that at the same time the lime partially neutralizes the acidity of the must. Still, later, potassium meta-bisulphide was used to clarify the must before boiling.

As, until recently, moskonfyt for human consumption was manufactured only on a small scale, the process has never been studied scientifically. During the depression in the wine trade in 1921-22, however, the question of using a part of the surplus must for the production of moskonfyt on a commercial scale repeatedly came up for consideration. Consequently, when the matter was seriously tackled, no satisfactory answer could be given to the following questions:—

(1) To what degree of sugar-content should the must be concentrated to prevent fermentation as well as crystallization?

(2) In what manner can the sugar concentration of boiling moskonfyt be determined?

(3) Is it necessary to subject the must to a special treatment before concentration?

Experiments to investigate these questions are then described.

There appears to be but little margin between the concentration necessary to prevent fermentation and that at which crystallization gives trouble.

Although not one of these samples has so far shown any fermentation, it is, nevertheless, experimentally proved (also at Elsenburg) that 65 per cent. sugar in moskonfyt is not high enough to prevent fermentation, and the Americans had the same experience. Apparently 65 per cent. sugar is about the limit where fermentation is still possible. These experiments have further clearly shown that 70 per cent. sugar is already too high, for all samples having sugar concentration of 70 per cent. and more have totally or partially crystallized. If there is an ideal sugar concentration for moskonfyt which will not result in any fermentation or crystallization whatsoever, this must clearly lie between 65 per cent. and 70 per cent.. Such an ideal sugar concentration, however, does not exist. In moskonfyt of 65 per cent. sugar, a certain amount of crystallization, although very slight, occurs. In practically all samples with a sugar concentration lower than 70 per cent. very little crystallization takes place. The conclusion arrived at is that, as far as concentration is concerned, from 68 per cent. to 69 per cent. sugar has given the most satisfactory results.

The determination of sugar percentage was made by means of a specific gravity bottle. The sugar-content corresponds with the specific gravity, and may be read from the specific gravity sugar tables* as found in certain books on chemistry. This method is not absolutely accurate, but is quite satisfactory for all practical purposes.

Another method, as yet only incompletely investigated, is based on boiling point determination by means of a very sensitive thermometer.

Moskonfyt of 66 per cent. sugar-boiling point, about 107° C.
Moskonfyt of 70 per cent. sugar-boiling point, about 108° C.
Moskonfyt of 72 per cent. sugar-boiling point, about 109° C.
Moskonfyt of 75 per cent. sugar-boiling point, about 110° C.

Regarding the treatment of must before concentration, it is necessary to reduce the acidity by the addition of lime, otherwise the moskonfyt will be too sour. It was decided, after judging the various samples, that it is absolutely necessary to reduce the acidity of the must to about 3 to 4.5 per cent. before concentration. In the case of the total acidity of the must being less than 30 per cent. the sweetness of the konfyt is nauseating, and with the total acidity at more than 4.5 per cent. it is too sour. It is further recommended preferably to use ground limestone (calcium carbonate). By using slaked lime (calcium

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* In Australia we are more familiar with the Baumé scale than with that of Balling, largely used at the Cape and in California and which is based on sugar percentage. The correspondence of the two is as follows:—

Balling	Baumé.
%	%
65	35·57
66	36·09
67	36·6
68	37·1
69	37·62
70	38·12

hydrate) the must easily becomes too highly neutralized, with the result that it gets a bitter taste and assumes a dark dirty colour. With ground limestone this never happens. The ground limestone used was 75 per cent. pure; the slaked lime about 90 per cent. pure.

Finally, it may be mentioned that some farmers are in the habit of letting the must ferment slightly before boiling. Presumably this prevents the moskonfyt from crystallizing so easily. As by such fermentation certain agents may form in the must, which later on prevent or reduce the crystallization of moskonfyt, some experiments were carried out. In one case (where 5 per cent. sugar was fermented out) two samples were boiled, yielding 70 per cent. and 74 per cent. sugar. In another case (where 1.5 per cent. sugar was fermented out) three samples moskonfyt were boiled, yielding 70 per cent., 71 per cent., and 72 per cent. sugar. In all of the five samples there was a minimum of crystallization compared with samples of similar sugar concentration in previous experiments. Probably the fermentation really had a good effect. The matter will, however, be more thoroughly investigated during the current year.

ANSWERS TO CORRESPONDENTS.

VITICULTURE.

Replies by Government Viticulturist

A correspondent from Griffith, New South Wales, asks:—

1. For advice as to whether resistant vine stocks should be planted, in view of the opinion expressed by Dr. Elwood Mead, that in America vignerons are not troubling about resistant stocks, as long as they are in a clean district.

Answer.—It is understood that such is often the case. In Californian viticultural periodicals, the fact is deplored, and the folly of thus ignoring the danger is often emphatically pointed out. It would be foolish to imitate America's bad example.

2. Is it true that vines grafted on resistant stocks yield less than vines on their own roots?

Answer.—It is not true that vines grafted on resistant stocks yield less than vines on their own roots. Provided the stock suits the scion and the soil, the yield is at least equal—indeed often superior.

3. Under irrigation, what are the best stocks for sultanas and currants?

Answer.—Under irrigation A.R.G. 1 is an excellent stock for both sultana and Zante currant. So far as present experience goes, we do not know of anything better.

4. In the event of Phylloxera entering a vineyard, making it necessary to work it over on resistant stocks, would the soil need a rest or could it be done at once?

Answer.—A vineyard dying from Phylloxera may be immediately replanted with resistant vines. They have nothing to fear from Phylloxera. Many

Rutherglen vineyards were thus immediately replanted and they have given excellent results. It is, nevertheless, well to plant vines on fresh land, just as one would do in the case of wheat or any other crop. A change is always desirable, but not on account of Phylloxera in the soil.

5. Would I get a stronger or better vine if I obtained No. 1 grade wood such as that used for bench grafting?

Answer.—Graftable cuttings will not give you a stronger vine than the smaller ones—an equally vigorous vine will result from either. The vine struck from the smaller cutting will, in fact, have less pith in its centre—a trifling advantage except, perhaps, in the case of Yema grafts executed on rather slender stocks.

6. Is there anything against planting such wood in nursery rows, budding it the following season and planting out as dormant buds?

Answer.—I should much rather plant out rootlings, where they are to remain, and "field-graft" them. Budding or grafting in the nursery means a delay of at least a season before the vines bear fruit. Cuttings may be first struck in the nursery, though this is not necessary—cuttings may be planted direct.

7. What is the best time to graft two-year-old vines—before or after shooting?

Answer.—It is better to graft when one year old (from plantation) than to await the second season before doing so. Early grafting is to be recommended if the spring is a favorable one; in a wet spring, graft late

A correspondent asks if there are any seeds in sultana grapes, and if so, how they are removed?

The Government Viticulturist replies that the sultana (or more correctly, the sultanina) is one of the seedless variety of grapes, of which there are several, mainly natives of Asia Minor. The flowers of these grapes are fertilized in the usual way, but the embryo seeds fail to develop and cannot after a while be distinguished from the pulp of the berry, so that when ripe these grapes have no seeds. Occasionally one finds, in a bunch of seedless grapes, an odd large berry in which the seeds have developed—these are not uncommon in the Zante currant. They are in fact a source of annoyance as they take much longer to dry than the smaller seedless berries. In the sultana they are very seldom met with

THE DESTRUCTION OF SNAILS.

It was found that *Helix pisana* fed readily on a mash made of calcium arsenate 1 part, by weight, and 16 parts of bran. In giving this poison bait a thorough trial a kill of 96 per cent. of all active snails was secured by one application in a garden plot 16 by 20 feet, which had over 6,000 snails. In a practical application about a heavily infested property the results were fully as satisfactory as in the experimental work. Being simple, inexpensive, and easily applied, it is now felt that an additional weapon with which to fight the snail has been secured.—From monthly *Bulletin*, Department of Agriculture, California, January-February, 1923, pp. 9-10.

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FIELD DAY AT RESEARCH FARM.

Science and Agriculture.

The Annual Farmers' Field Day at the State Research Farm was held on the 28th September, when about 600 farmers from all parts of Victoria attended, most of them making the journey by special train from Melbourne to Werribee, where they were kindly met by local residents, who conveyed them to the Farm. Among those present were—Dr. E. Page, Acting Prime Minister; the Hon. P. G. Stewart, M.H.R., Minister of Works and Railways; the Hon. L. Atkinson, M.H.R., Vice-President of the Executive Council; the Hon. M. E. Wettenhall, M.L.A., Assistant Minister of Agriculture; and Mr J. H. Lister, M.H.R.

In welcoming the visitors, Dr. Cameron (Director of Agriculture) apologized for the absence of the Premier (Mr. Lawson) and the Minister of Agriculture (Mr. Old), both of whom had gone to attend the ceremony of turning the first sod of the Moama to Balranald railway.

Mr. A. E. V. Richardson (Agricultural Superintendent) briefly outlined the objects of the Farm. In remarking on the backward appearance of many of the crops, he said that, though the average rainfall for the district was 20 inches, the fall from the beginning of the year had so far been only 10 inches, which was only an inch more than the fall recorded for a similar period of the 1914 drought year.

The afternoon's tour was begun with a glance at the various rotation tests, the object of which is to determine the most profitable system of cropping, and, as the plots were passed by, Mr. Richardson made a running commentary on the results obtained from the different rotations.

As in former years, most of the visitors were very interested in the lucerne fields. By means of poles, the increase of lucerne hay obtainable from applications of water was indicated. The results showed that at least 24 inches of water, in addition to the average rainfall, is necessary to maintain favorable moisture conditions, though that quantity does

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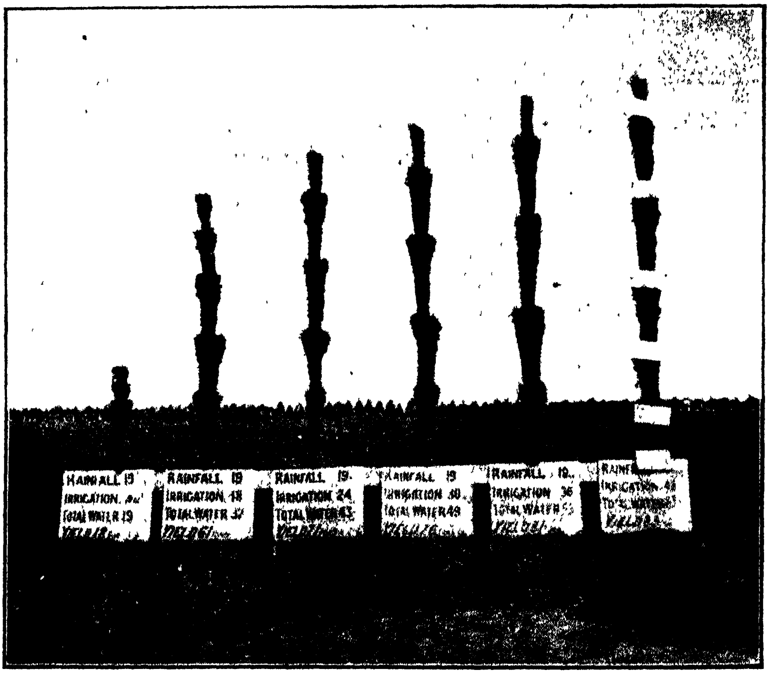
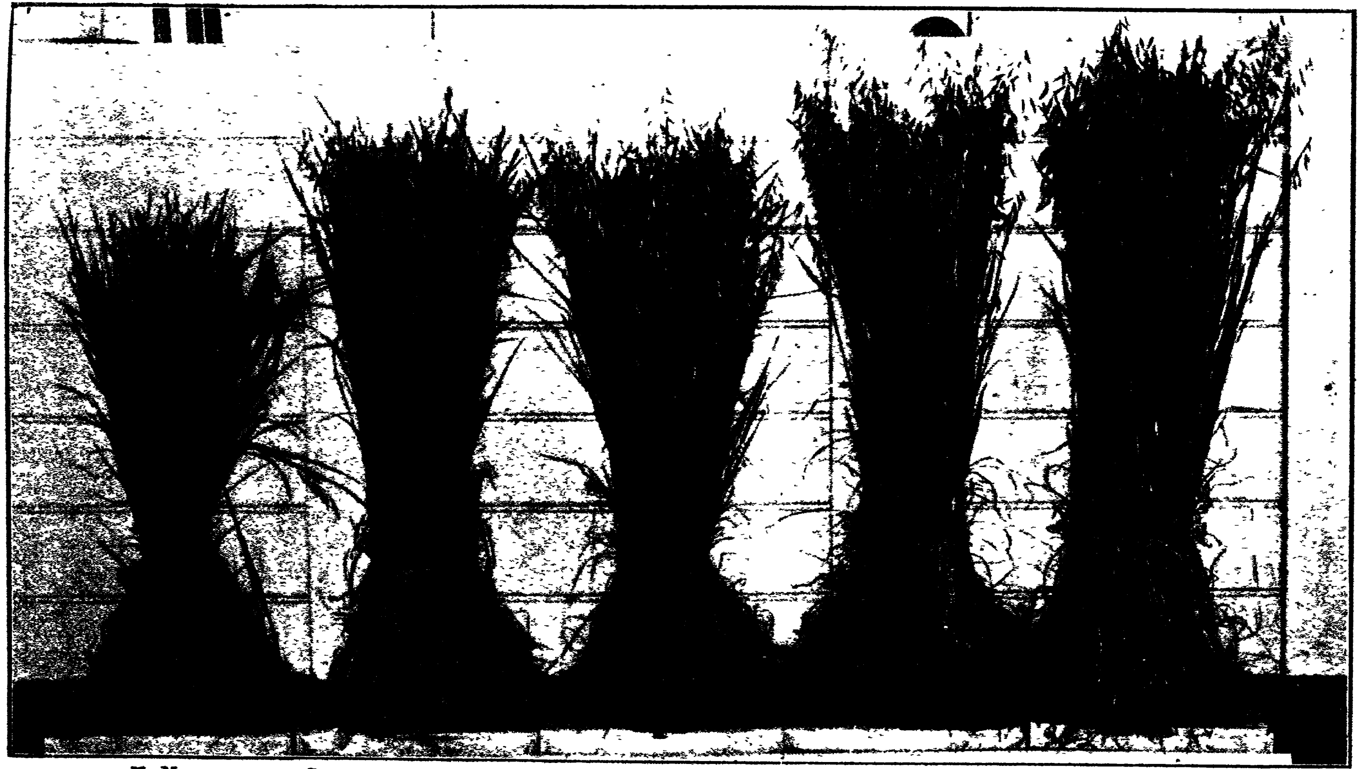
not set a limit to profitable irrigation. In commenting on the several fertilizer tests with lucerne, Mr. Richardson advocated annual dressings of superphosphate of 2 cwt. per acre, and said that the use of gypsum in combination with superphosphate had given splendid returns The value of gypsum, Mr. Richardson explained, is chiefly due to its modifying the texture of the subsoil, and allowing the water to percolate more readily, thus favoring the deeper rooting of the plants. The methods of renovating the lucerne stands were described by Mr. Wilson, the Farm Manager, who also described the experiments that are being conducted in the growing of grasses and clovers under irrigation.

The Red Poll and Friesian herds were inspected and in the course of a brief address Dr. Cameron said the policy of the Department in its live-stock activities was to undertake innovations which were beyond the scope of the ordinary farmer, and which, if successful, would be a gain to the whole State. It was with this object that the Red Poll herd was established many years ago, and the Friesian herd in 1919, the foundation members of which were obtained from the New Zealand Government by the exchange of an equal number of Red Polls. In the last Government Herd Test the Werribee Red Poll herd, which was the largest in the Test, occupied sixteenth place, and Dominion Queen Mercedes, one of the Friesians imported from New Zealand and afterwards purchased by Messrs. Flack and Sewell, was awarded second place in the contest for the *Weekly Times* prize for the greatest butter-fat production over three days.



Lucerne Poles Illustrating Yield of Lucerne Hay from Application of Varying Quantities of Water.



No Manure. Super ½ cwt. per acre. Super. 1 cwt. per acre. Super. 1½ cwt. per acre Super. 2 cwt. per acre.

Representative Samples from Manurial Field, Showing Influence of Superphosphate in Hastening Maturity.

(Photographed in green state.)

The stud cereal plots were visited. In these plots upwards of 1,000 new varieties, chiefly wheat, obtained by hybridization, are in different stages of development, and varieties received from experiment stations in different parts of the world are also being tested in this section.

The visitors were then shown the Permanent Fertilizer Plots, where the value of different kinds and varying quantities of fertilizers could be seen, and on the way back to the farmstead the plots devoted to green manurial and feeding-off tests were hurriedly inspected

Speech by the Prime Minister.

When afternoon tea had been partaken of, Dr. Page (Acting Prime Minister) proposed a vote of thanks to the Government and the officers of the Department of Agriculture. He said he had been delighted to accept the invitation to see what was being done at the Research Farm. It was interesting to him, who came from the northern part of New South Wales, to see some of the efforts that were being made by the Government of Victoria toward making farming more profitable—a problem that was exercising every Government in the world. Every one recognised that, without a prosperous agriculture as a basis of national life, no stable structure could be raised, for it was only upon the progressive prosperity of the primary industries that we could hope to build up any successful system of manufactures.

In Australia, more than in any other country of the world, it was essential that farm life should be made attractive, so that those already on the land might remain there, and more and more be attracted. We had a huge continent with a population of less than 6,000,000, or less than two to the square mile, while in Great Britain there were 380 people to the square mile, and in Belgium more than one to the acre. Japan had a population of three to the acre, and in Java, which was only two-thirds the size of Victoria, there were 40,000,000 people.

Throughout the world the doctrine of effective occupation was being continually spoken, and, therefore, the settlement of our empty lands was a question of greatest importance. What was being done at the Research Farm in the application of science to farming was an important factor in the solution of the problem, and whatever was achieved there would be reflected throughout the whole State. (Applause.)

It was necessary to find out the best way of using water and fertilizers, and it was the proper function of a Government to carry out experiments in these matters, and if the lessons taught by the plots were followed throughout the country, it would be of great benefit to every one. As Dr. Cameron had said during the day, not many farmers could afford to carry out experiments, but at an institution controlled and financed by the Government various object-lessons in the way of progress could be given.

He was particularly glad to know that his colleague, Mr. P. G. Stewart, was co-operating with the Government in setting apart a portion of his farm at Carwarp for experimental work, as the methods followed in other portions of the State might not be suitable for the Mallee.

It was necessary to know what could be obtained from the land with the least drudgery and expenditure of money, and if we could improve the standard of living and reduce the hours of labour, we would see daylight ahead of us. During the last twenty years particularly, the whole of the improvement in the general standard of living had been borne on the back of the man on the land.

A Voice.—Their backs are nearly broken.

The yield of wheat had increased as a result of improved methods, and in dairying the average quantity of milk per cow had increased 20 gallons per year, and these advances benefited the whole country. The secondary industries should also endeavour to obtain increased efficiency, and so cheapen production that the effective wage would be increased.

The Government of Victoria seemed fully alive to its responsibility in regard to primary production, and he congratulated them on the highly efficient officers who were doing so much to increase the State's prosperity. Dr. Cameron was a man whose reputation was known throughout Australia. Mr. Richardson was doing more for wheat-growing than any one else in the Commonwealth, and Mr. Wilson, the Farm Manager, also deserved high praise. Very often no commendation was given deserving men while they lived, though many were willing to heap flowers on their hearses. (Laughter.) He was glad, therefore, to pay a tribute then to the officers of the Department of Agriculture.

The Hon. P. G. Stewart, Minister of Works, &c., in seconding the vote of thanks, said that the value of the experimental work being done by the Department of Agriculture was gradually being recognised by the farmers of Victoria. Though to-day we were perhaps inclined to smile at the farming methods of twenty years ago, we were apt to forget that in another twenty years some might smile at our efforts. He was of opinion that millions of pounds were being lost annually in Victoria by wrong methods of cultivation, by sowing unsuitable varieties of seed, and from the lack of sufficient fertilizers. Though farmers once looked with distrust on experimental work, that distrust was now dying out, and he believed that the money voted by the Government for experimental work gave greater value to the community than any other portion of its expenditure. He heartily congratulated Dr. Cameron, Mr. Richardson, Mr. Wilson, and the other members of the staff.

The Hon M. E. Wettenhall (Assistant Minister of Agriculture), in acknowledging the vote of thanks, said he appreciated the response to the Government's invitation to see what was being done in research work at the Farm. The District Council of the Wimmera farmers had requested him to urge the Government to provide more money for the extension of research work, though a few years ago they would have characterized such work as waste, and the Government would learn of this change of opinion from him. He wished the Treasurer were present, for money was wanted for agricultural work, and if he could hear the opinions already expressed, perhaps his heart would be softened.

It was said that some of the young fellows from our agricultural colleges were roaming away to other States because they could not secure land in Victoria. He was glad to say that the Cabinet was considering this matter, and hoped to be able to announce soon that every boy who passed through one of our agricultural colleges would have the opportunity of taking up suitable land.

Dr. Cameron responded on behalf of the few who had been named, and the many whose names were not mentioned, and to whom was due so much of the credit for the work seen that day. He had never been associated with any institution in which the staff so heartily co-operated as at the Research Farm.

He was extremely glad that Mr. Stewart was able to be present. Farming experiments could not go far without the co-operation of the man on the land. The Department had had that co-operation from many, but from none more than from Mr. Stewart. He had long been preaching the gospel of improved methods throughout his district, and, despite duties that had come upon him as a parliamentarian, and more recently as a Cabinet Minister, he was still helping the Department by attending to the details of the experimental work on his farm at Carwarp. More men of his stamp were required. (Applause.) Dr. Cameron concluded by expressing his pleasure that the Federal Cabinet thought the occasion of sufficient importance to be represented by three of its members.

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CLEAN MILK SCHEME.

Some interesting particulars are now available concerning a "Clean Milk" Scheme which was operated last year in Birmingham. Under this scheme bacterial counts were taken every day from a sample of the milk sent in by each of the supplying farmers. A bonus was then paid at the end of every month to the 36 farmers whose milk during the month was found to contain the lowest number of bacilli per cubic centimetre. Of these 36 farmers, the 12 whose score was the lowest received one pnny per gallon extra for all their milk, and the next 24 a half-penny per gallon extra. In this way some of the farmers who competed received from £50 to £60 each more for their milk than they otherwise would have received. The following were the best six and the worst six scores (in bacteria per cubic centimetre) during the months mentioned: —

Lowest Scores (Cleanest Milk).

	May, 1922.	August.	December.
1	9,000	3,400	6,650
2	12,000	9,900	7,500
3	14,000	12,000	8,500
4	18,000	12,750	10,900
5	22,200	14,250	12,900
6	32,000	16,000	13,500

Highest Scores (Dirtiest Milk).

	May, 1922.	August.	December.
1	10,744,666	8,070,000	648,800
2	12,000,000	10,488,500	750,000
3	16,042,000	11,640,000	859,500
4	Uncountable	12,010,000	1,377,000
5	,,	15,035,500	1,950,000
6	Approx. 30,000,000	19,580,000	over 50,000,000

Some 80 to 90 farmers in all competed under this scheme, and it is understood that the average bacterial count of half of them was lower than 20,000 per c.c. (From Journ. of Ministry Agric.)
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IMPROVEMENT OF MECHANICAL CONDITION OF SOILS AND SUB-SOILS.

With Special Reference to the Use of Gypsum (*calcium sulphate*).

[Paper by H. A. Mullett, B. Agr. Sc., Senior Inspector of Agriculture, and P. Rankin Scott, Chemist for Agriculture, read at the Pan-Pacific Science Congress, Melbourne, August, 1923.]

It is generally conceded that the physical attributes of soils limit the yields of crops, at least as much and as often as the chemical ones. Hence the importance of improving the physical condition. In Victoria the main physical defects may be grouped as—

(1) Defects of texture.

(2) Defects of structure.

On these largely depend percolation, capilarity, aeration, etc., as well as such qualities as ease of tillage, root penetration, etc.

Among soils of unsatisfactory texture may be included those which are too loose, as well as those which are too stiff. The chief drawback of loose soils in a dry climate is the difficulty in consolidating them sufficiently well below the surface to permit the plants to draw on such of the supplies of stored water as can be obtained by capillary action. On the other hand, the loose nature of the soil is of great advantage, in that a surface mulch is readily obtained and maintained.

Interesting examples of soils of this class occur in the north of Victoria, in the Mallee and Wimmera. There the average annual rainfall ranges from 12 inches in the northern part to 17 inches in the south, the soils are fairly rich in plant food, but the particles are somewhat deficient in the power of cohesion. Apparently, the cementing material of the crumbs is weak, because if cultivated when in a dry state to any extent they are easily reduced to a dusty powder to a depth of six or seven inches—a condition detrimental to the growth of wheat there. Recognition of this fact has led the farmers to take special precautions to effect the necessary consolidation of the soil two or three inches below the surface. They do that by—

(1) Ploughing shallowly from 3½ to 4 inches deep.

(2) Tilling only when the soil is moist, and to a regular depth (about 2½ inches).

Wheat is, of course, raised on moisture-conserving fallows. The art of fallowing land there consists largely in pugging the under layers of soil together when they are wet, and then maintaining a shallow mulch on top of the firmly pugged soil. Sheep, horses, etc., are looked upon as valuable aids in affecting consolidation.

As a class, soils which are too loose are deficient in either humus, clay, or other materials capable of cementing the particles together and of giving a reasonably permanent crumb-structure when tilled. In some the looseness is related to the quantity of lime present, and others are loose merely because they happen to exist in regions where the rainfall is insufficient to pack the particles together.

Among the group of soils of faulty texture in which the particles adhere too strongly are stiff clays and other soils whose particles after wetting and drying cement together, especially at the surface. Examples of the stiff clays occur in the Western Plains (volcanic). Many of these crumble naturally when drying out, and are better worked then. Others, if cultivated much, crumble down to a fine dust, which after wetting and drying sets hard. This condition is detrimental to the germination and growth of plants. Examples of such soils occur in the red clays of the Wimmera and Goulburn Valley. Their amelioration is a pressing problem.

Under the heading soils of faulty structure may be included those in which the subsoil is too porous, as well as those where it is relatively impervious to water. The first mentioned type will not stand drought, and is difficult to irrigate by flooding, because of excessive seepage. The latter include those where the subsoil is merely a stiff clay. In others it is a definite hard-pan layer, such as clay or sand cemented with lime, silica, iron, etc. Soils with hard-pans dry out easily, and readily become water-logged in winter or under irrigation. Few hard-pans are absolutely impermeable to water, hence if the surface soil admits the water slowly enough, there may be no water-logging. Conversely, where the hard-pan is overlaid by a freely permeable material, such as sand or silt, the water-logging is more pronounced.

The most extensive examples of soils of faulty structure are the light soils of the Western Wimmera, where a few inches of fine sand overlies a white cement, which rests on a clay hard-pan, merging into a dense clay a foot or so thick, as at Goroke. Then, many of the Goulburn Valley soils are potentially faulty in structure, in that the subsoil holds up irrigation water sufficiently long to interfere with the growth of crops, like lucerne. In some cases the tap-roots do not penetrate far into the subsoil, and in others the surface roots are forced to feed in a water-logged environment, while the tap-roots feed in a comparatively waterless one.

It is with soils of faulty structure such as has been described that this paper is most concerned.

Some Remedies for Physical Disabilities.

There are a number of well-known remedies for most of the physical disabilities cited. Some, such as rotation systems, are designed to slowly improve the organic content of the soil, and thus the physical properties that it confers. With others it is possible to effect the improvement almost at once. Thus there is under drainage for water-logged soils; lime and gypsum where the texture requires improvement. For hard-pan, subsoiling may often be employed with success, also blasting with explosives. A generally hard-pan is assumed to be out of reach of soil amendments. Each of these methods of soil amelioration is employed in this State, but not to any great extent. So far as humus additions are concerned, the improvement brought about, though probably quite definite, is difficult to measure, even after repeated additions to the soil of substantial quantities of green manure.

Stable manure is not available here in any quantity. Under-drainage is so costly that its use is confined to districts growing high-priced crops. The same applies to subsoiling and blasting. Subsoiling is out of the question where the hard-pan offers much resistance, as in bands cemented with iron, or where it is too deep. One difficulty in blasting is in shattering the subsoil thoroughly, otherwise the holes fill with water, and water-log the plants.

As a soil ameliorant, lime cannot be said to have been exhaustively tested over the whole of Victoria. However, where substantial dressings have been applied to soils of the clay-loam type, as at Werribee, Rutherglen, and in the Western district, little, if any, benefit in texture has been noted, nor are there any very marked increases in production. In tests of more than five years' duration the best increase so far obtained with wheat has been 18 per cent., but in a large number of instances on soils with fairly stiff clay subsoils, there has been no increase whatever. Thus, at the Research Farm, Werribee, where in all five tons of agricultural lime (quicklime) have been applied to the same piece of land during the past eleven years, no increase has been obtained. The following table gives the results. The lime was tested in conjunction with superphosphate, which is a limiting factor to growth:—

TABLE I.—TESTS WITH LIME ON WHEAT AT RESEARCH FARM, WERRIBEE. AVERAGE OF ELEVEN YEARS' RESULTS.

No manure	7·7 bushels per acre.
Super. 1 cwt.	14·5 ,, ,,
Super. 1 cwt. + lime 5 cwt.	14·4 ,, ,,
Super. 1 cwt. + lime 10 cwt.	14·2
Super. 1 cwt. + lime 20 cwt.	13·9 ,, ,,

However, at Rutherglen, on fairly stiff clay loams, subject to some water-logging in winter, the following average increases have been obtained:—

TABLE II.—TESTS WITH LIME ON WHEAT AT RUTHERGLEN. AVERAGE OF SIX YEARS' RESULTS.

—	Average yield	Increase due to lime	Per cent. increase due to lime
	bushels.	bushels	
No manure	9·7	..	..
Super., 1 cwt.	15·7	..	..
Super., 1 cwt. + lime, 5 cwt.	17·8	2·1	13
Super., 1 cwt. + lime, 10 cwt.	17·4	1·7	11
Super., 1 cwt. + lime, 20 cwt.	18·5	2·8	18

Here the last-named field has received in all five tons of lime per acre. As compared with the plot receiving superphosphate only, the yield has been increased by a maximum of two bushels per annum. The returns from the field receiving lime in 5 cwt. doses, or 25 cwt. in all, shows the greatest relative increase per unit quantity of lime. Quite possibly this is due to soil amelioration, if not wholly, then in part. The increased crop is worth about 8s. 4d. per annum, valuing the wheat at 4s. per bushel. This has cost 8s. 6d. per annum to produce, valuing the lime at 42s. 6d. per ton. So far the application has not shown a profit, but the residual effect ought to be worth something. The heavier dressings have resulted in a considerable loss. On certain soils, notably at Lilydale and Goroke, applications of lime have been found to increase the difficulty of cultivation.

The Effect of Gypsum.

Applications of gypsum have been fairly regularly made to orchards and vineyards in some of the irrigation districts, notably at Renmark, in South Australia; Mildura, in Victoria; and more recently at Yanco, in New South Wales. The results have given satisfaction, and the use of gypsum is gradually extending. Some of these soils, especially at Yanco, are not very permeable to irrigation water, and definite improvement in this direction has been noted by growers where heavy applications have been made. Also it is believed by them that gypsum would free potash from the soils which are fairly well supplied with it, and hence confer a benefit on the vines, citrus fruits, etc., which appreciate potash.

So far little gypsum has been applied to the refractory clay loams in the irrigation districts of Victoria, other than Mildura, and none for general cropping purposes under dry farming conditions. Gypsum was included in the official lucerne experiments at Werribee in 1920, but the first trials made to test its efficacy in breaking up definite hard-pan in wheat lands were commenced at Goroke in 1921, in May of that year. The soil (already briefly described) was definitely faulty in structure The cement layer and the clay so hold up the winter rains that the soil assumes a water-logged condition, and is said locally to be "spewy." This is often so pronounced that horses are liable to break through the crust of even virgin land, and penetrate to the hard-pan. If attempts are made to cultivate land when approaching this condition, it may be reduced to a thick greyish slush, which on drying sets like mortar. Lime was not at first applied to these soils, because it was known that quite a good "concrete" for building the walls of houses could be made by mixing the surface soil with about 20 per cent. (by weight) of slaked lime. It was thought that lime would tend to cement the upper layers of the soil, though that has yet to be proved. Lime has been included in the tests this year.

In using gypsum at Goroke, it was thought that it would afford a critical test of the flocculating powers of this salt, and it was especially intended to find out whether heavy applications on the surface would affect a subsoil layer a couple of feet thick. The gypsum was applied at the rate of 1½ tons per acre, together with 1 cwt. of superphosphate per acre (18 per cent. P_2O_5). This was done because the soil was markedly deficient in phosphoric acid, which constitutes one of the principal factors limiting growth. Both the superphosphate and the superphosphate and gypsum applied together gave most remarkable increases in yield These were confirmed by a duplicate set of plots laid down in the following year (1922).

TABLE III.—EXPERIMENTS WITH WHEAT AT GOROKE.
RESULTS 1921-1922.

..	1921.	1922.	Average, two years.
	bushels.	bushels.	bushels.
No manure	6·5	9·0	7·7
Basic phosphate, 1 cwt.	14·7	16·7	15·7
Super., 1 cwt.	16·3	15·1	15·7
Super., 1 cwt. + gypsum, 1½ tons	27·4	25·6	26·5
Super., 2 cwt.	21·4	20·2	20·8

Size of plots, ¼ acre each.

Five manurial plots were sown each year on fallow with Federation wheat. 70 lbs. per acre. Seeded end May.

The land was virgin soil and typical of a large area.

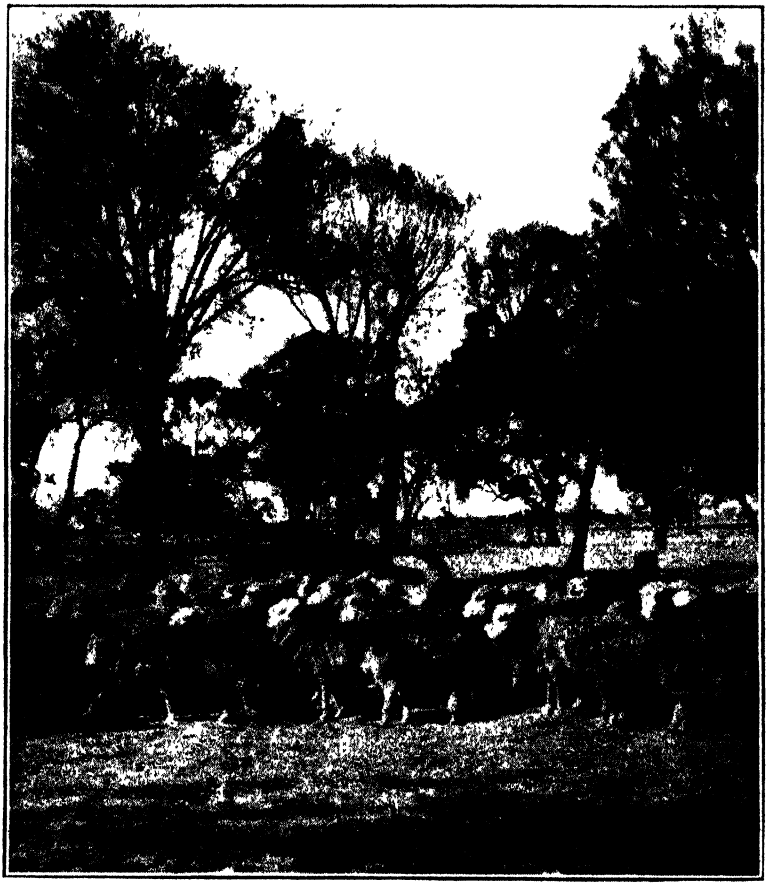
Phosphatic manures, at the rate of 1 cwt. per acre, it will be noted, have raised the yield by eight bushels per acre, i.e., about 104 per cent. One and a half tons of gypsum increased the yield obtained from 1 cwt. of superphosphate by an average of 10.8 bushels, *i.e.*, by a further 69 per cent. This increase is many times in excess of that hitherto obtained in Victoria by the use of any lime derivative in official tests. The application of 2 cwt. of superphosphate by itself increased the yield substantially, as compared with 1 cwt. It is as yet a matter of supposition as to what would have happened had the gypsum been applied with this quantity of superphosphate. But it seems reasonable to infer that the yield would have been still further enhanced. Subsequent to the first year of the Goroke experiments, applications of gypsum were made to wheat at Cavendish, 70 miles further south, on a silty soil, which overlies yellow clay at a depth of three feet. The rainfall here is about 32 inches annually. Also at Torrumbarry (15 inch rainfall), near Echuca, on a stiff red clay, on a windswept plain, and at Willaura, on a fairly well drained sandy loam, somewhat inclined to acidity.

At Cavendish it is difficult to grow two profitable crops on the same land without a prolonged spell. Growth is satisfactory for a couple of months, but subsequently it becomes stunted, and is very liable to attacks of takeall (*ophiobolus gramminis*). The experiments were conducted on land previously cropped. The yields are, therefore, low. The yields of the check plots accord well with average yields obtained on old land. The percentage increases due to gypsum are, however, even heavier than those at Goroke.

TABLE IV.—TESTS WITH GYPSUM ON WHEAT.

——	Yield.	Increase *above* super., 1 cwt	Increase per cent.
	bushels.	bushels.	
No manure	1·4	..	..
Super., 1 cwt.	5·6	..	..
Super., 1 cwt. + lime, 10 cwt.	7·8	2·2	39
Super., 1 cwt. + gypsum, 1½ tons	10·9	5·3	94
Super., 1 cwt. + gypsum, 3 tons	14·6	9·0	160

An application of three tons of gypsum to 1 cwt. superphosphate has increased the yield by 160 per cent., as compared with 1 cwt. superphosphate by itself. With a ton and a half of gypsum the corresponding increase was 94 per cent.



Typical Goroke Country.

The Torrumbarry figures are as follow:—

Table V.—Experiments with Wheat at Torrumbarry.
Results, 1922.

	Yield	Increase due to fertilizer and amendment	Increase due to gypsum	Per cent. increase.
	bushels	bushels	bushels	
No manure	5·3	..	..	..
Super., ½ cwt.	7·7	2·4	..	..
Super., 1 cwt.	7·7	2·4	..	..
Super., 1½ cwt.	7·7	2·4	..	..
Super., 1 cwt. + gypsum, 3 tons ..	9·3	4·0	1·6	21

The season was dry, and the yields were low. The gypsum was responsible for an increase of 21 per cent. Here the texture of the surface soil was markedly improved.

At Willaura, on the loamy soil, the increased yield attributable to 30 cwt. gypsum was 6.7 per cent. only. Ten hundredweight of lime produced a greater increase.

TABLE VI.—EXPERIMENTS WITH WHEAT AT WILLAURA. RESULTS, 1922.

—	Yield.	Increase due to fertilizer and amendment.	Increase due to amendment	Per cent increase.
	bushels	bushels	bushels	
No manure	9·4	..	..	..
Super., 1 cwt.	20·9	11·5	..	..
Super., 1 cwt. + gypsum, 3 tons ..	22·3	12·9	1·4	6·7
Super., 1 cwt. + lime, 10 cwt. ..	22·5	13·1	1·6	7·1

Gypsum was applied here because there happened to be a deposit within half a mile of the experiments.

With lucerne, at Werribee, three years' tests, commenced in 1920, show that gypsum is apparently superior to lime, but, as compared with superphosphate, the increases attributable to the amendments are relatively low.

TABLE VII.—EXPERIMENTS WITH LUCERNE, RESEARCH FARM, WERRIBEE. AVERAGE RESULTS, 1920-22, INCLUSIVE.

—	Yield	Increase due to fertilizer and amendments	Increase due to amendments	Increase per cent.
	cwt	cwt.	cwt	
No manure	116·8	..	..	.
Sulphur, 1 cwt .. .	129·4	13·6	..	..
Super., 1 cwt.	135·3	18·5	..	.
Super., 2 cwt.	143·6	26·8	..	..
Super., 3 cwt.	146·3	29·5	..	..
Super., 4 cwt.	151·6	34·8	..	..
Super., 2 cwt. + gypsum, 1½ tons ..	158·2	41·4	14·6	10
Super., 2 cwt. + lime, 10 cwt. ..	138·9	22·1	Decrease	..
Super., 2 cwt. + lime, 20 cwt. ..	142·9	26·1	Decrease	..

Thus the increase attributable to gypsum is 14.6 cwt.; equal to 10 per cent. of that product by superphosphate, 2 cwt.

The results of the field tests cited may be summarised thus:—The increased yields attributable to gypsum range from 6.7 per cent. to 160 per cent. for wheat. For lucerne, at Werribee, the increase is 10 per cent. The greatest percentage increase was obtained at Cavendish, following an application of three tons of gypsum per acre. The only other substantial increase was that at Goroke, where 30 cwt. of gypsum was used. It is significant that at both these centres water-logging of the soil is most pronounced.

Possible Cause or Causes of the Increased Yields.

Gypsum has been used for many years for increasing the yields of crops, more especially in other parts of the world. Thus thirty years ago it was proved to substantially improve the yield of vines on certain soils in France. Then followed a regular boom in its use there.

Numerous workers have enquired into the cause of the increases obtained, and many investigations have been made into the effect of the gypsum on soils. Among the things claimed for it in specific instances are the following:—

(1) Liberates potash in an available form.
(2) Stimulates symbiotic bacteria in certain legumes.
(3) Neutralizes deleterious substances, such as sodium carbonate.
(4) Lime and sulphur supplied as plant foods.
(5) Weakens the basic reaction resulting from plant growth and so assists in the retention of a loose texture by the soil.
(6) Flocculates "colloidal clay," and hence improves the texture of the soil.

The claims that potash is liberated have been generally accepted for many years, and more recently have been confirmed by D. K. Tressler, G. B. Lipman and W. F. Gericke, and P. R. Miller. Tressler (Soil Science, 6 (1918), No. 3, pp. 237-257) conducted experiments which appeared to show that potash was liberated by the use of gypsum in most fertile clay loams. Little was released in sands and silts tested. The work of Lipman and Gericke (Univ. Cal. Pub. Agric. Sect. 3 (1918), No. 10, pp. 277-282) incidentally confirmed this result. Potash was found to be rendered more soluble by the addition of either calcium, carbonate, or calcium sulphate, in a clay adobe soil, but not in the case of a "blow sand."

P. R. Miller (*Jour. Agric. Research*, 14 (1918), No. 1) showed that soils mixed with one per cent. gypsum and kept moist as in the field, showed marked increases in the content of water soluble potash. However, L. T. Briggs and J. F. Breazeale (*Jour. Agric. Research*, 8 (1917), No. 1, pp. 21-28) showed that in certain soils derived from orthoclase felspars, the solubility of the potash may be depressed by the use of gypsum. Evidently, then, potash may, or may not, be liberated by gypsum, depending on the type of soil treated.

It is quite possible that liberation of potash has played some part in increasing the yields at Goroke, but as wheat has not responded to potash elsewhere in Victoria, this aspect has not yet been investigated. The gypsum used itself contains some potash. The amount applied in this way would be equivalent to about 20 lbs. potash sulphate per acre. Probably this would satisfy the needs of the crop. The following is an average analysis of the samples of gypsum used:—

Sulphuric anhydride (SO_3)	41·09 per cent.
Sulphuric, calculated as ($CaSO_42H_2O$) ..	88·35 „
Phosphoric acid (P_2O_5)	·021 „
Potash (K_2O)	·419 „
Potash as sulphate (K_2SO_4)	·776 „

STIMULATION OF NODULE BACTERIA.

In America and elsewhere gypsum has effected notable improvement in legumes, such as lucerne and red clover. W. Pitz (*Jour. Agric. Research*, Jan., 1916) showed that certain increased yields in red clover treated with gypsum were associated with increased development of the root nodule bacteria. This work received corroboration from that of H. G. Miller (*Jour. Agric. Research*, vol. XVII., June, 1919). As wheat has no nodules, this cannot be regarded as a cause, but it is a possible explanation of the small increased yield of lucerne obtained at Werribee.

NEUTRALIZATION OF DELETERIOUS SUBSTANCES SUCH AS SODIUM CARBONATE.

It has been claimed that on soils affected with black alkali (sod. carb.), an application of gypsum leads to a double decomposition with the formation of two innoxious substances, calc. carbonate and sodium sulphate. However, as these soils tested are not obviously affected with deleterious salts this aspect has not yet been investigated.

LIME AND SULPHUR AS PLANT FOODS.

It is possible that plants are able to derive both these substances ultimately from gypsum. The soil, however, contains enough lime to furnish the quantity of this substance required as plant food. Sulphur has recently been proved of more importance as a plant food than was formerly supposed. Applications of two cwt. of sulphur spread over two years have resulted in an increase of 11 per cent. in the yield of lucerne at Werribee. Curiously enough, this increase is very much of the same order as increase in lucerne attributable to gypsum there. Possibly then, this is the explanation for the increase due to gypsum there. But it is unlikely that the deficiency in lime and sulphur as foods is limiting growth seriously at Goroke. At any rate, it can only be part of the explanation.

"WEAKENS BASIC REACTION RESULTING FROM PLANT GROWTH AND SO ASSISTS IN THE RETENTION OF A LOOSE TEXTURE BY THE SOIL."

This theory has been put forward by O. Nolte (*Jour. Chem. Soc., Lond.*, 112 (1917), No. 660, pp. 624). It is claimed that in certain soils that gypsum undergoes hydrolytic decomposition into acid and base and hence influences the reaction of the soil, especially by virtue of the constituent with the predominating reaction—*i.e.*, sulphuric acid. This is said to weaken the basic reaction resulting from plant growth, and so assists in the retention of a loose texture by the soil. The theory has not yet been confirmed by other workers.

FLOCCULATES COLLOIDAL CLAY AND HENCE IMPROVES THE TEXTURE OF THE SOIL.

It is a matter of every-day laboratory observation that gypsum, in common with a number of other soluble salts, such as sulphates, chlorides, *e.g.*, ferrous sulphate, sodium chloride, ammonia sulphate, also hydro-oxides, *e.g.*, Ca $(oH)_2$, will flocculate suspensions of clay in water, and hence precipitate them. C. A. Jensen (*Jour. Afric. Research* (1918), pp. 505-518) showed that they reduce the percentage of colloidal substances, mainly clay, present in certain soils. Others, including O. Nolte (Landw. Vers. Sta. 98 (1921), No. 3-4) showed that solutions of gypsum and other salts increase the permeability of soils. And the inference is that the flocculation of the colloidal particles frees the clogged pores of the soil.

Some Notes on the Present Investigation.

As both the Goroke and the Cavendish soils water-log badly because of a very impervious clay subsoil in a highly "colloidal" state, it was concluded by the writers that possibly the main effect of the gypsum was a partial flocculation of this clay. The clay is very finely divided and densely packed. The aggregation of the particles into groups should permit of greater permeability and of a general physical improvement. Accordingly investigations were undertaken, the scope of which included the sampling of the treated and the untreated field plots, and a determination of the amount of "colloidal" clay in each at the end of one year's and two years' treatment. It will be recognised that there is considerable difficulty in making satisfactory comparisons with samples taken under field conditions, because at best the samples must represent a very small proportion of a very variable whole. Nevertheless, it was thought that the effects at Goroke and Cavendish were critical cases well worth testing. Later on, it is proposed to apply gypsum to these soils under controlled conditions in the laboratory. As time permits, a comprehensive study will be made of the effect of gypsum on plant growth, and on the physical properties of the soil. The Goroke soil was selected for the initial work because here the clay is near the surface. Hence the difficulties of sampling were reduced.

Represented diagrammatically, the "soil profile" of the Goroke soils is as follows:—

	ft.	in.
Soil (fine sand)	0	2¾
White cement sand	0	3
Hard dark-brown clay densely packed and showing columnar structure	0	4½
Soft dense yellow clay	1	7¾
	2	6

Clay with Sand and Marl.

The following is a mechanical analysis of a typical Goroke soil by the Sudan method:—

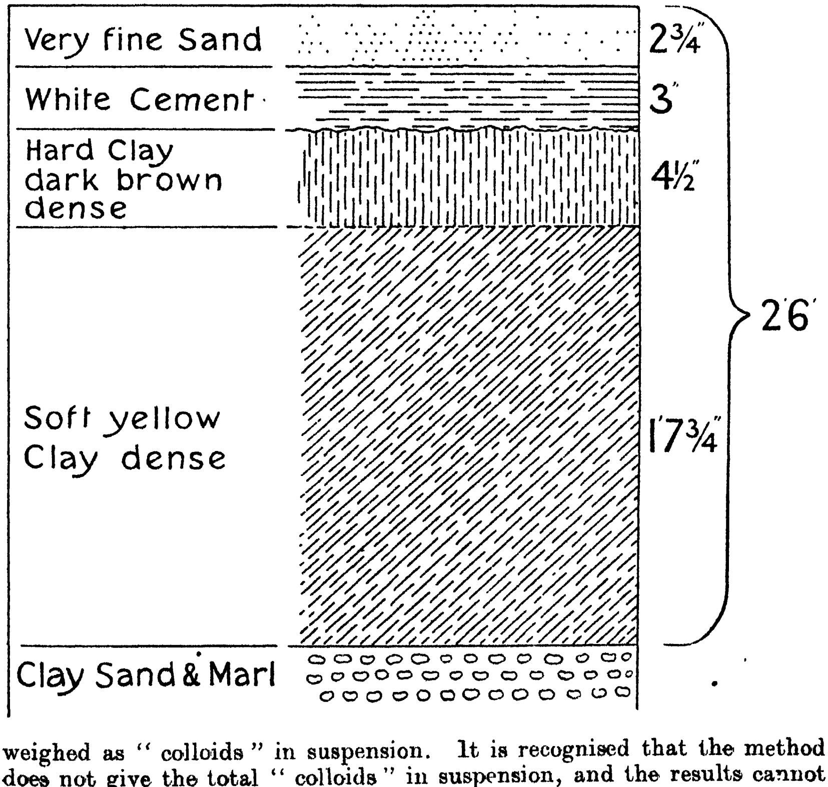
- -	Very coarse sand	Coarse sand	Medium sand	Fine sand	Very fine sand.	Silt.	Clay	Moist.	Total.
	%	%	%	%	%	%	%	%	%
Soil ..	·48	12·84	17·88	20·72	37·28	1·18	8·78	·64	100·00
Cement .	·32	7·96	15·28	30·24	33·48	1·80	10·70	·22	100·00
Hard clay	·16	3·04	7·92	14·80	18·82	3·00	49·90	1·36	100·00
Soft clay	·00	3·12	6·16	12·64	14·64	3·36	58·11	1·97	100·00

The soil and the cementing layers are, therefore, composed largely of fine sand with a small percentage of clay. These overlie a subsoil containing a very high proportion of clay.

The method selected for the determination of the percentage of "colloids in suspension," was that cited by C. H. Jensen (*Jour.*

Agric. Research, Dec., 1918, pp. 505-518) slightly modified. Five grams of soil were placed in a 250 c.c. Erlenmeyer flask, 50 c.c. distilled water added, then placed on a water bath for one and a half hours, the flask and contents being periodically shaken. The liquid portion was then decanted into a cylinder of 3 cm. diameter and 25 cm. high. This process was repeated twice. The liquid, with clay in suspension in the cylinder, was made up to 180 c.c., well agitated, and left to stand 24 hours. The suspended matter was siphoned off and precipitated with neutral sulphate of ammonia, then filtered, ignited, and weighed as " colloids " in suspension. It is recognised that the method does not give the total " colloids " in suspension, and the results cannot be used for comparisons with the Sudan method. But Jensen proved that satisfactory comparisons could be made of treated and untreated soils. With this the writers are in agreement. Duplicate determination of the " colloids " with same sample gave—

Soil Profile - Goroke



13.48 per cent.
13.86 per cent.

And in another—

9.57 per cent.
10.22 per cent.

The "colloids" in the main are "colloidal" clay, a term first suggested by Schloesing, and which was adopted by Hilgurd and other workers. If refers to the finest clay particles which readily enter water suspension, and can be precipitated from it by certain salts. Colloidal clay has jelly-like properties.

There are two experiment fields at Goroke, each divided into a number of ¼-acre plots. One field was sown to wheat in 1921 after fallow, and the other in 1922. There were thus available for sampling treated and untreated plots for each year. At first samples of each layer of soil and subsoil to a depth of 2 ft. 6 in. were obtained in two places in each plot. When these were analyzed, it was found that the soil variations were as great as any that could have been expected from the gypsum. It was then decided to obtain a large number of samples from each plot, so that a reasonably fair average of each plot could be obtained. This was done with a soil augur. Fifteen samples of each layer of soil and subsoil were obtained from each of the four plots, *i.e.*, two treated and two untreated. The composite samples were analyzed with the following result:—

TABLE VIII.—SHOWING PERCENTAGE OF "COLLOIDS IN SUSPENSION" IN EACH LAYER OF TREATED AND UNTREATED PLOTS.

I. Wheat sown and gypsum applied 1921; sampled 1923—

Section.	No manure.	Gypsum and Superphosphate.
	per cent. colloids.	per cent colloids.
Soil	·44	·42
Cement	·90	·71
Hard clay	25·99	20·34
Soft clay	33·85	22·83
	61·18	44·30
Average per cent. colloids	15·29	11·07
Reduction due to gypsum	4·22	

II. Wheat sown and gypsum applied 1922, sampled May, 1923—

Section	No manure.	Gypsum and Superphosphate.
	per cent. colloids	per cent. colloids.
Soil	·26	·46
Cement	·43	·84
Hard clay	20·16	23·80
Soft clay	24·46	12·06
	45·31	37·16
Average per cent. colloids	11·33	9·29
Reduction due to gypsum	2·04	

Subsequently equal quantities of each section were mixed, and determinations in duplicate made, with the following results: —

Table IX.—Showing Percentage of "Colloids in Suspension" in Composite Samples of Treated and Untreated Soils.

I. Wheat sown and gypsum applied in 1921; sampled May, 1923—

—	No manure.	Gypsum and Superphosphate.
	per cent. colloids.	per cent. colloids.
Per cent. colloids in composite sample	13·48	9·57
	13·86	10·22
	27·34	19·79
Average	13·67	9·89
Reduction in colloids due to gypsum	3·78	

II. Wheat sown and gypsum applied 1922; sampled May, 1923—

—	No manure	Gypsum and Superphosphate.
	per cent. colloids	per cent. colloids.
Per cent. colloids in composite sample ..	11·37	7·35
	11·30	8·67
	22·67	16·02
Average	11·33	8·01
Reduction in colloids due to gypsum	3·32	

The tables show that the percentage of colloids has been reduced by an average of over three per cent. on the total measurable quantity in the soil. The soft clay, which occurs at a depth of about a foot, and is 1 ft. 7 in. thick, appears to be most affected, and the figures show that the reduction of the colloids in suspension, in this case, is about one-third in the case of the 1921 sown plots, and one-half in the case of the 1922 sown plots. The average reduction in these two layers is between 11 and 12 per cent. "colloids," i.e., about 40 per cent. In a soil whose pore space can be pictured as clogged with gelatinous clay, a reduction of this order should make a significant difference in its permeability.

It is probable that greater results cannot be expected by an application of this amount of gypsum, because 30 per cent. does not contain sufficient of the mineral to precipitate all the clay in an acre of soil two feet deep. An attempt was made to roughly gauge the gypsum requirement of this Goroke soil, assuming that a complete alteration in the clay to a depth of two feet was required, and could be effected.

A series of water suspensions of the clay was prepared by shaking up five grams of a composite sample of the untreated soil with 180 c.c. of water. These were treated with varying quantities of a saturated solution of gypsum. The minimum quantity of this solution required to precipitate in 24 hours the suspended matter was 5 c.c. Calculating each acre foot of soil as 3,500,000 lbs., and the solubility of the gypsum as two parts per thousand, this gives a gypsum requirement of 3.134 tons per acre foot, or about six tons for two feet. Hence, if the assumption is correct, under the most favourable circumstances, it would require six tons of gypsum to completely alter the clay to a depth of two feet. From this it can be deduced that to obtain the maximum effect heavier dressings than 30 cwt. are necessary.

Economic Significance.

It is, perhaps, too early to attach much economic significance to these somewhat imperfect results at this stage. For one thing, it has not been proved that lime will not produce the same result if applied at the same rate as gypsum at Goroke and Cavendish though that is rather improbable. Slaked lime is an excellent agent for flocculating suspensions of clay in water; but when placed on a soil it reverts fairly rapidly to the carbonate form, which is practically insoluble in water. Thus it appears likely that lime would be slower in its action than gypsum, because it does not get into the soil solution so readily. Again, lime has been found to aggravate the cementation of some soils in Victoria. O. Nolte (Landw. Vers. Sta. 8 (1921), No. 3-4, pp. 135-153) has shown that on a " puddled humus soil " lime had no more influence in increasing the permeability than water, while gypsum increased it. The efficacy of gypsum may serve to some extent to explain the remarkable potency of superphosphate as a fertilizer under Australian conditions. The usual application ranges from ½ cwt. to 1½ cwt. per acre. Each hundredweight of the fertilizer consists of 55 lbs gypsum. Thus, in the course of ten years 5 cwt. of gypsum are applied in this way. Is it not possible that this quantity is sufficient to clear the soil pores of colloidal matter to some extent, and thus contribute to the result ?

Assuming the Goroke results sound, the following table gives the commercial aspect. Wheat has been calculated at 4s. per bushel, superphosphate at £5 10s. a ton, and gypsum 35s. a ton, spread on the land. Gypsum has been recently quoted at Goroke in bulk at less than half that rate: —

TABLE X.—SHOWING EXTRA PROFIT PER ACRE ATTRIBUTABLE TO THE USE OF SUPERPHOSPHATE AND SUPERPHOSPHATE AND GYPSUM AT GOROKE.

AVERAGE OF RESULTS, 1921-1922.

Treatment per acre	Increase due to fertilizer	Value of increase	Cost of manure and soil amendment.	Extra profit due to the use of manure and amendment.
		s. d.	s. d.	s. d.
No manure	..	..	..	..
Super., 1 cwt.	8·0	32 0	5 6	26 6
Super., 1 cwt. + gypsum, 30 cwt. ..	18·8	75 2	58 0	17 2
Super., 2 cwt.	13·1	52· 5	11 0	41 5

Thus it will be seen that despite the heavily increased yield due to gypsum the cost of the heavy application needed absorbs a good deal of the profit. An application of 2 cwt. superphosphate by itself is the most profitable form and quantity to apply if the effect of gypsum were not reasonably lasting. Experiments are now in progress to determine that all-important point. It is difficult to forecast how long the effect will endure. If the same rate of improvement can be maintained for five crops the gypsum applications would show a very substantial profit. The profit obtained by the use of 1 cwt. of superphosphate would be increased by 32s. 8d. per crop per acre. If only half that rate were obtained, the extra profit would be 11s. per acre per crop.

There is, roughly, an area 70 miles square, i.e., about three million acres, in Western Victoria, where the soils are in structure similar to those at Goroke. At present it hardly pays to cultivate these, and they are given over to the merino sheep. Gypsum may transform it into profitable wheat country. Then there are large areas of stiff reddish clays in the Wimmera and Goulburn Valley. Gypsum may improve these profitably. In the irrigation settlements much of the soil requires opening up before lucerne will grow satisfactorily. So there is an immense field.

As to the supplies of the material, millions of tons of it occur naturally in the north of Victoria, especially in the Mallee None of the districts mentioned is more than 450 miles by rail from the furthest north deposit, and many are as close as one hundred miles by rail. The freight on a ton of gypsum for 450 miles is 11s. 8d., which is not prohibitive. Gypsum occurs in circumstances which render it possible to instal bulk handling appliances. This could be done if there were sufficient demand. Even with crude hand methods, quotes as low as 7s. per ton on trucks in bulk have been obtained. Bulk handling would reduce this by half.

Summary.

Physical properties of soils are as important as the chemical one. In Victoria, as elsewhere, the principal defects are those of texture and of structure. There are a number of well-known remedies for most physical defects. These include slow-acting remedies, such as rotation systems, providing for humus additions; and quick-acting ones, such as under-drainage, and the use of soil amendments, such as lime and gypsum. For defects of structure there are subsoiling, blasting, etc. Most of these remedies are costly, though their use could be extended. There is need for a cheap method of opening up structurally defective soils, such as those where there is hard-pan or impervious clay subsoil.

Results of experiments on soils subject to water-logging in winter at Goroke show that gypsum increased the yield 69 per cent., and at Cavendish 160 per cent. Elsewhere the increases were not above 20 per cent., on soils which do not water-log. Investigations made on samples taken with a soil augur from the treated and the untreated field show that the " colloids " with clay subsoil were substantially reduced. In one layer the reduction was equal to 40 per cent. of the colloids present. The reduction is evidently due to flocculation and precipitation of the colloids in suspension. From this it is inferred that the pore space of the soil is freed of gelatinous clay substances, and hence permeability to water and other properties are improved. There are large supplies of gypsum available in the north of Victoria. If the gypsum will remain active in that soil for a few years, a substantial profit will result from its use, even at present prices, which could be reduced substantially if the demand increases.

The experiments are incomplete, and further investigations are pending.

COMPOUNDING RATIONS.

W. A. N. Robertson, B.V.Sc., Chief Veterinary Inspector.

In order to simplify the compounding of rations for the dairy cow, which should vary within certain limits according to the size of the animal and the amount and test of the milk she yields, the graphic method on page 599 has been compiled by Mr. M. J. G. Colyer, B.E. (Sydney), Assoc. M. Inst., C.E., from an article by the writer in *Australian Farming.*

For those not familiar with the graphic method, the following explanation is given:—The maintenance ration of fat, protein, and carbohydrate for animals of various weights is shown by the lines running across the chart to O.O.F., O.O.P., and O.O.C.H. on the right hand.

For a cow in milk, additions must be made according to the quantity and test of the milk. All quantities and tests cannot be shown, but an approximate figure may be found in the following manner:—

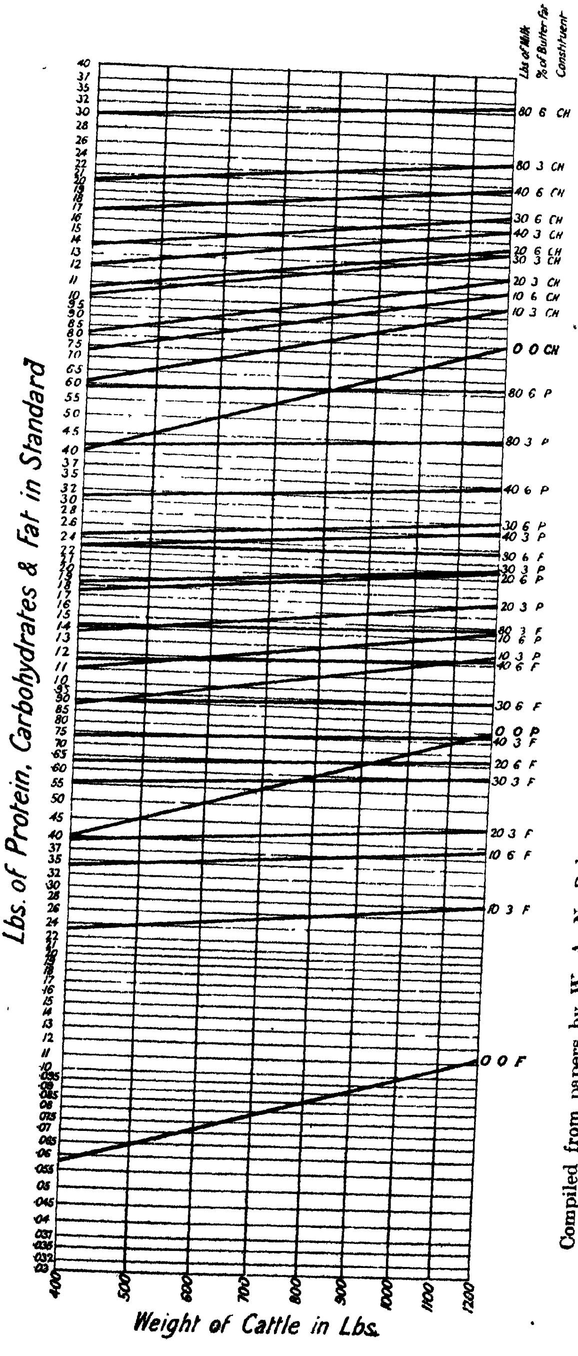
Suppose one wishes to ascertain what ration should be given to a 900-lb. cow giving 30 lbs. of 5 per cent. milk. Figures are shown on the chart for animals giving respectively 30 lbs. of milk of 3 per cent. fat, and 30 lbs. of 6 per cent. fat. It will be readily seen that the indicator in the case of a cow giving 30 lbs. of milk of 5 per cent. fat will fall in its relative position between the two other numbers, *i.e.*, approximately one-third of the way below 30.6 F. and two-thirds of the way above 30.3 F. on the perpendicular line, indicating 900 lbs. weight. Thus the result appearing on the left margin will be .80.

Protein is found by taking 30.3 P. on the right hand, and moving two-thirds of the distance towards 30.6 P. The cross line intersecting the 900-lb. perpendicular line will thus run towards the figure 2.4 on the right hand, which indicates the required amount of protein. By the same system the carbohydrate necessary is found to be 15.0. How these amounts may be supplied is then determined from the table of food constituents, and the following illustrates the result:—

lbs.		P.	C.H.	F.
30	Maize silage	0.54	4.05	0.18
15	Chaff (oaten)	0.67	6.55	0.22
10	Bran	1.10	4.20	0.25
1	C. oil cake	0.16	0.42	0.09
		2.47	15.22	0.74
Standard from graph		2.4	15	0.80

A ration for any quantity and quality of milk may be determined in similar manner from the remainder of the tables, and its actual cost ascertained, while from the formulæ of Comparative Value of Foods, any ingredients may be compared to ascertain the cheapest.

FOOD MIXING CHART.



Compiled from papers by W. A. N. Robertson, B.V.Sc., and from other sources by M J. G. Colyer, B.E. (Sydney), Assoc. M. Inst., C.E.

GREEN FODDER.

	Dry Matter.	Protein	Carbo-hydrates.	Fat	Nutritive Ratio	Food Units
	%	%	%	%	/:	
Barley	21·0	1·9	10·2	0·4	5·8	15·9
Clover—Red	29·2	2·9	14·8	0·7	5·6	23·8
Cocksfoot Grass	27·0	1·5	11·4	0·5	8·4	16·4
Cow Pea	16·4	1·8	18·7	0·2	5·1	23·7
Horse Bean	15·8	2·2	7·1	0·2	3·4	13·1
Kentucky Blue Grass	35·0	3·0	19·8	0·8	7·2	29·3
Lucerne	20·0	3·7	7·3	0·6	2·3	18·0
Maize	20·7	1·0	11·6	0·4	12·6	15·1
Oats	37·8	2·6	18·9	1·0	8·2	27·9
Pasture Grass Mixed	20·0	2·5	10·2	0·5	4·5	17·7
Rye	23·4	2·1	14·1	0·4	7·1	20·3
Saltbush	23·5	2·5	9·2	0·3	3·9	16·2
Sorghum	20·6	0·6	12·2	0·4	22·0	14·7
Soya Bean	24·9	3·2	11·0	0·5	3·8	20·2
Vetch	19·9	3·9	7·3	0·5	2·2	18·3

SILAGE.

	Dry Matter.	Protein	Carbo-hydrates.	Fat	Nutritive Ratio	Food Units
Barley	26·0	1·8	12·7	0·9	8·3	19·4
Clover	28·0	2·0	13·6	1·0	8·0	21·1
Cockstoot Grass	23·0	1·1	10·6	1·0	11·9	15·8
Maize	24·6	1·8	13·5	0·6	8·3	19·5
Oaten	28·0	·5	14·8	0·9	11·3	21·8

ROOTS, ETC.

	Dry Matter.	Protein	Carbo-hydrates.	Fat	Nutritive Ratio	Food Units
Apples	19·2	0·7	16·6	0·4	25·1	19·3
Beet—Pulp	10·2	0·6	7·3	0·4	12·1	9·8
Cabbage	15·3	1·8	8·2	—	5·1	12·7
Carrots	11·4	0·8	7·8	0·4	10·4	10·8
Mangolds	9·1	1·1	5·4	0·2	5·1	8·6
Parsnips	11·7	1·6	11·2	0·1	7·3	15·4
Pie Melon	7·15	0·7	3·5	0·2	7·1	5·7
Potatoes	21·1	0·9	16·3	0·6	18·4	20·0
Pumpkins	9·1	1·0	5·8	0·1	6·5	8·6
Rape	14·0	1·5	8·1	0·3	5·7	12·6
Turnips	9·5	1·0	7·2	0·2	7·7	10·2
Beet—Leaves	12·0	1·7	4·6	0·2	3·2	9·3

HAY.

	Dry Matter.	Protein	Carbo-hydrates.	Fat	Nutritive Ratio	Food Units
Barley	91·5	5·8	43·1	1·6	8·1	61·6
Clover—Red	84·7	6·8	35·8	1·7	5·8	57·0
Cow Pea	89·3	10·8	38·6	1·1	3·8	68·3
Grass—Mixed	87·1	5·9	40·9	1·2	7·3	58·6
Lucerne	89·1	12·3	37·1	1·6	3·3	71·8
Oaten	89·9	4·5	43·7	1·5	10·5	58·7
Rye Grass	86·0	6·1	37·8	1·2	6·6	56·0
Vetch	88·7	12·9	37·5	1·4	3·1	73·2
Wheat	91·2	3·6	46·1	1·1	13·5	57·8

STRAW.

	Dry Matter.	Protein	Carbo-hydrates.	Fat	Nutritive Ratio	Food Units
Barley	85·8	0·7	41·2	0·6	61·0	44·4
Corn Stover	59·5	1·4	31·7	0·7	23·8	36·9
Oaten	90·8	1·2	38·6	0·8	33·8	43·6
Oat Hulls	90·6	1·71	48·3	0·7	29·3	54·3
Pea	86·4	4·3	32·3	0·8	7·9	45·0
Soya Bean	89·6	2·3	40·0	1·1	18·5	48·5
Wheat	90·4	0·4	36·3	0·4	93·2	38·3
Wheat Chaff	85·7	0·3	23·3	0·5	81·8	25·3

Grain and Seeds.

	Dry Matter %	Protein %	Carbo-hydrates. %	Fat %	Nutritive Ratio /:	Food Units.
Barley	90·0	9·6	63·5	2·1	7·1	92·7
Cow Pea	85·2	18·3	54·2	1·1	3·1	103·0
Linseed	90·0	19·4	18·0	34·7	5·4	153·0
Maize	89·4	7·8	66·7	4·3	9·9	96·9
Oats	89·0	9·2	47·3	4·2	6·2	80·8
Peas	89·5	16·8	51·8	0·7	3·2	95·5
Rice	87·7	5·3	67·6	0·3	12·8	81·6
Soya Bean	89·2	29·6	22·3	14·4	1·9	132·0
Sunflower	92·5	12·1	20·8	29·0	7·7	123·0
Wheat—Old	91·7	13·7	47·6	1·4	3·7	85·3
,, Average	89·5	10·2	69·2	1·7	7·2	98·9

Products.

	Dry Matter %	Protein %	Carbo-hydrates. %	Fat %	Nutritive Ratio /:	Food Units.
Brewers' Grains—Wet	24·3	3·9	9·3	1·4	3·2	22·5
Cocoanut Oil Cake	85·9	16·4	42·2	9·1	3·9	106·0
Dried Blood	91·5	52·3	—	2·5	—	137·0
Linseed Meal	89·1	26·1	38·5	6·5	2·0	120·0
Maize Meal	88·0	8·4	66·3	3·4	11·6	96·0
Maize Oil Meal	—	18·7	27·1	20·9	3·2	126·0
Malt Combing	94·7	26·1	50·6	1·5	2·0	120·0
Molasses	—	-	62·0	—	—	62·0
Mollerne (Lucerne and Molasses)	80·0	11·3	47·0	2·2	4·8	82·0
Oat Branning	95·4	14·9	51·8	7·9	4·8	109·0
Pea Meal	89·5	16·8	51·8	0·7	3·2	95·0
Peanut Meal	89·5	49·9	22·8	6·9	0·8	165·0
Polly Feed	89·0	14·0	52·0	2·0	4·0	92·0
Wheat Bran	88·3	11·2	42·2	2·5	4·3	76·0
Pollard	88·3	12·2	53·4	3·8	5·1	93·0
Milk	12·8	3·6	4·9	3·7	3·6	23·0
Skim Milk	9·4	2·9	5·2	0·3	2·0	14·0
Buttermilk	9·9	3·9	4·0	1·1	1·7	16·0
Whey	6·6	0·8	4·7	0·3	6·0	7·0

Comparative Value of Foods.

$$2{\cdot}5\,(\text{P.} + \text{F.}) + \text{C.H.} = \text{Food Units} = \text{F.U. in long ton.}$$

$$\frac{\text{Price of long ton}}{\text{F.U.}} = \text{Price of Food Unit for comparison.}$$

Nutritive Ratio = N.R.

$$\text{N.R.} = \frac{\text{C.H.} + 2{\cdot}5\ \text{F.}}{\text{P.}}$$

Approximate Starch Equivalent.

$$\text{P.} + \text{C.H.} + 2{\cdot}2\ \text{F.} = \text{S.E. in 100 lbs. of the food.}$$

Lbs. per Bushel.

Barley	50
Beans	60
Linseed	56
Maize	56
Oats	40
Peas	60
Wheat	60
Pollard	20
Bran	20

Price per 2,240 lbs. =	Pence per lb.	Price per 2,240 lbs. =	Pence per lb.	Price per 2,000 lbs. =	Pence per lb.
£ s.		£ s.		£ s.	
2 0	0·2143	5 0	0·5357	1 0	0·12
2 5	0·2410	5 5	0·5625	4 0	0·48
2 10	0·2678	5 10	0·5892	4 5	0·51
2 15	0·2946	5 15	0·6160	4 10	0·54
3 0	0·3214	6 0	0·6428	4 15	0·57
3 5	0·3482	6 5	0·6696	5 0	0·60
3 10	0·3750	6 10	0·6964	5 5	0·63
3 15	0·4018	6 15	0·7232	5 10	0·66
4 0	0·4286	7 0	0·7500	5 15	0·69
4 5	0·4553	7 5	0·7768	6 0	0·72
4 10	0·4821	7 10	0·8036	6 5	0·75
4 15	0·5089	7 15	0·8303	6 10	0·78
		8 0	0·8571		

1s. per ton = 0·00536 pence per lb.

5s. per ton = 0·03 pence per lb.
1s. per ton = 0·006 „ „

* * *

POULTRY NOTES FROM STATE RESEARCH FARM, WERRIBEE.

By W. O. Pederick, Poultry Foreman.

Hatching operations for this season have now been completed. About 2,500 chickens have been hatched. Five hundred of the earliest of these are now on free range in colony houses, and in spite of the rough weather are doing exceptionally well.

Cockerels are always separated from the pullets as soon as possible; this gives the pullets a better chance to develop.

Leghorn cockerels hatched in July will be ready for the Cup market. Such birds, if well fed, are usually marketable when fourteen or sixteen weeks old.

All male birds should now be removed from the breeding pens. If this be done, the hens will lay better, and, further, infertile eggs keep better either in preservative or in cool storage.

A sharp look-out must be kept for vermin, and perches and nests should be examined frequently for red mites. If any are found, the wood-work should be painted with kerosene. It is also very necessary that dust baths should be available for all birds.

At this time of year hens of heavy breed are inclined to go broody. Any broody hens should be placed in a wire-netting cage suspended from the roof. If this be done in the early stages, the broodiness will be easily broken-off; from twenty-four to forty-eight hours in the cage is usually sufficient.

PASSION FRUIT CULTURE IN VICTORIA.

(Continued from page 488.)

By J. Farrell, Orchard Supervisor.

XV.—Sterility and Kindred Defects.

Provided the growing conditions be favorable, the black passion produces a great number of early blossoms, and a relatively high percentage of these set fruit; but, when those conditions are not satisfactory, the crop matured is often light.

Sterility may become apparent in either of two forms. A number of blossoms may grow to about one-third full size, then, without opening, lose their vitality, turn yellow, and drop from their cups; in other cases some blooms may attain full size, open naturally and be apparently fertilized, but soon afterwards wither and fall from the flower cups. Cups from which immature flowers have fallen are illustrated in Fig. 29; three of those may be seen at different nodes on the lateral between the matured fruits and the terminal bud, and at the fourth node from the base of leader (B), in Fig. 25, an empty cup, from which a fully matured and apparently fertilized flower has fallen, is visible. Either or both forms of sterility may be noticed in leaders or laterals, but these mostly occur in the order as shown. These objectionable forms are less pronounced, however, in localities where ideal climatic conditions prevail. Some plants are greater offenders in this regard than others; therefore, when selecting seed from which to propagate young vines, growers should give this matter careful attention, and collect seed from the most precocious and prolific bearers only.

Either form of barrenness mentioned may occur at any time during the flowering period; but as a rule the dropping of the apparently-fertilized flowers happens early in the fruit season, while the immature blossoms usually fall in mid-season, or just prior to the setting of the late crop. The losses sustained through these forms of sterility are sometimes serious, but they may be reduced to a minimum by careful seed selection, good cultivation, manuring, and heavy pruning.

As passion fruit is grown for its pulp, planters should endeavour to prevent any form of barrenness likely to militate against the production of the highest number of fruits per vine, or the yield of fruit not containing a full quantity of pulp.

There is another defect, which may be regarded as akin to the two forms of barrenness already described, sometimes found in passion fruit. This irregularity may exist in fruits of outwardly apparent normal growth, but which, when cut open, show that some or all of the seeds are neither developed nor enclosed in the usual natural pulpy covering. This form of barrenness is illustrated in Fig. 31, which shows the two transverse sections of one fruit to the left, and the longitudinal sections of another appear to the right in the picture. To thoroughly realize this objectionable condition, the reader should compare the sections under notice with the corresponding sections of the well-filled fruits shown in Fig. 2 in this *Journal* for December, 1922. There are rarely any external indications of the "empty" condition of such fruits, but as they are light compared with the "full" fruits; practical pickers and packers quickly detect and reject such "duds."

A properly developed, ripe fruit contains three elongated clusters of seeds running from end to end of same. There are 50 seeds in each cluster, or 150 altogether, each seed being covered with pulp and enclosed in a fine film or skin. The seeds are borne on short, stout fibres or threads which project inwards from the capsule or shell, the clusters describing a triangle, as shown in the cross-sections in Fig. 31.

The pistil of the flower being in three divisions, it is obvious that these correspond with and are the responsible media through which their respective clusters of seeds are fertilized. These defective fruits usually grow to full size, some ripen a few seeds, but a high percentage are like those illustrated, in which not a single seed had matured. This class of fruit rarely appears on the Common Black passion until late in the fruit season when the weather becomes cold, and when the vines feel the effects of previous heavy cropping.

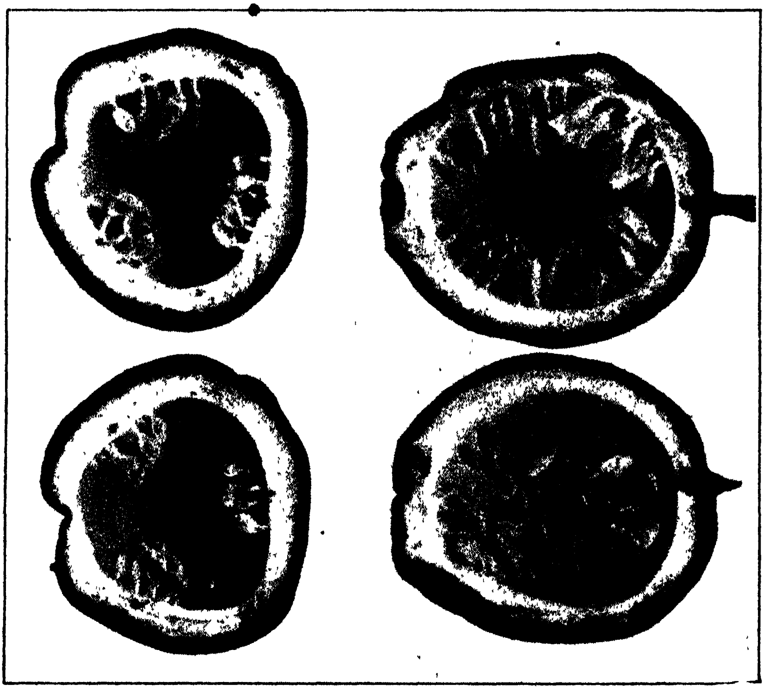


Fig. 31.—Transverse and Longitudinal Sections of Two Full-grown *P. edulis* Fruits Without Matured Seeds or Pulp.

The last remark does not apply in the case of the Mammoth, however, as it is a more regular offender in this regard, producing many empty or partly empty fruits during the whole season. The two Mammoth fruits cut into sections to correspond with the Common Black specimens appear in Fig. 32. Here only three seeds matured in the fruit cut into cross-sections, but not a single seed developed in the one cut longitudinally. Some vines yield more of these worthless fruits than others; and the five-year-old plant from which the two fruits illustrated were picked never yielded a perfect specimen. Here again we have an indication of the need for careful seed selection.

A grower determining on raising vines from the seeds of such fruits as these would certainly be wooing failure. There is no occasion for planters and others interested to become alarmed at this irregularity appearing in the Common Black passion, because this condition may be reduced to a minimum, if not absolutely eliminated, from this variety by practising the methods of seed selection, cultivation, pruning, &c., previously advocated. But in the Mammoth the different forms of barrenness (apart from shy bearing), and particularly the one under consideration, are more extensive and serious in their effect because of the apparent inherent tendency of this sub-variety to produce these worthless fruits. Nevertheless, there is evidence that further acclimatization may prove a helpful factor in encouraging productivity.

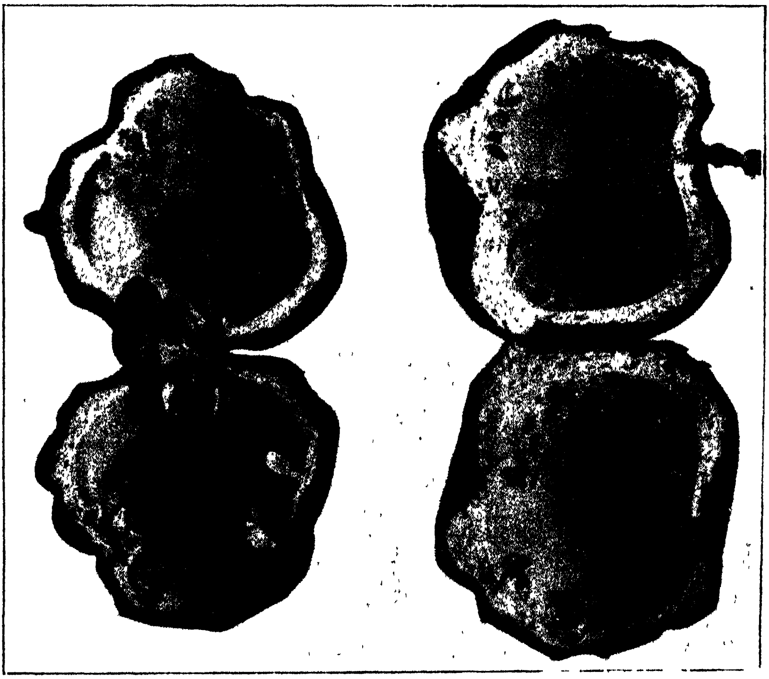


Fig. 32.—Transverse and Longitudinal Sections of Two Fully-grown Mammoth Fruits Showing only Three Matured Seeds and Their Pulp.

XVI.—Insect Pests and Fungous Diseases, and their Treatment; Experimental Spraying, and Woodiness.

Like other vines and fruit trees, the passion has its insect and fungous enemies. Because of the failure to fully employ the recognised methods of preventive and remedial treatment against these in the past, many growers have sustained rather serious losses. Having realized the approximate amount of these losses, however, in fruit as well as that suffered through injury done to the vines, and because of the recently revived interest and enthusiasm in the cultivation of passion vines, most growers are intent on dealing with these pests and diseases in the most vigorous manner in future.

The vines suffer considerably more through the development of fungous organisms than they do from insects. Occasionally, the stems and roots are attacked by the white ant (*Termes Australis*). These rarely infest young vigorous vines, but confine their attention mostly to old and decaying ones, and to those affected with Collar Rot. Vines from the stems of which the bark has been removed through the careless use of cultivating implements are also liable to suffer from this trouble. When the bark is broken, the wood quickly dries, and thus the ants may obtain an entrance. Having gained admission, they commence tunnelling through the stem and soon destroy it.

The preventive measures against this attack consist of keeping the soil around the vines well cultivated, and in regularly examining the stems to see that their bark is intact and healthy. When a vine is found to be infested, the best treatment is to inject kerosene, crude petroleum, or red oil emulsion into the affected parts, taking care that the emulsion penetrates every section of the tunnellings. Seriously damaged plants should be grubbed out and burned, and the soil treated to a heavy dressing of lime before replanting.

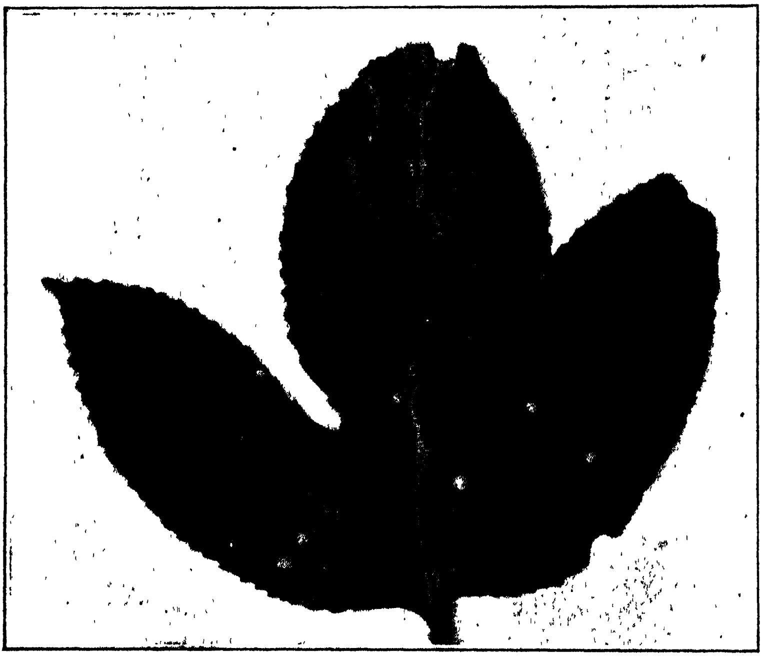


Fig. 33.—Leaf of the Common Black Passion Affected with Brown Spot.

Leaf eaters and aphis pests rarely attack the passion, but scale insects sometimes infest the vines, mostly attacking the leader growths, the greatest offenders being Brown Scale (*Lecanium Oleoe*) and the Greater Vine Scale (*L. Berberidis*). These pests, however, may easily be kept in check, if not absolutely eradicated, by the use of red oil emulsion (1 in 35) or crude petroleum (1 in 25) applied as a spray in late winter.

FUNGOUS DISEASES.

Of the fungous diseases which attack the passion vine Brown Spot of the leaf and fruit (*Glœosporium sp.*) may be regarded as the most injurious, as it causes by far the most serious losses in fruit, and damages the plants to the greatest extent. As in the case of most fungoid growths, this thrives best under humid atmospheric conditions. When the fruit season is wet, considerable quantities of passions are destroyed; whereas, in dry seasons the losses caused by this disease are hardly noticeable.

Fig. 33 illustrates a leaf of the Common Black passion affected with Brown Spot. The spores or seeds of this disease, which are very minute, finding a lodgment on the moist leaves or fruit, send out spore-tubes or roots; these enter the epidermis or skin through the stomata or breathing pores therein. The diseased spot is at first relatively small and pink, but, as the ramification of the fungus proceeds, a series of fairly well-defined, dark-coloured concentric circles become visible, indicating the lateral, radiant expansion of the mycelium or root system. Later, the centres of spots on leaves become almost white, whereas those on fruit turn black. To fully realize this, compare the spots on the leaf under notice with those on the two ripe fruits illustrated in Fig. 34. Not alone does this fungus live at the expense of its host, but, after having reached a certain forward stage of development, it seems to emit a fluid which is apparently poisonous to the host. This condition is more noticeable in the leaves, for these become very sickly, quickly turn yellow, and drop off when serious infection occurs. When the functioning of the leaves is interfered with in the manner described, partial defoliation of the vines follows; the fruit ceases to develop, and sometimes a high percentage of the crop is destroyed.

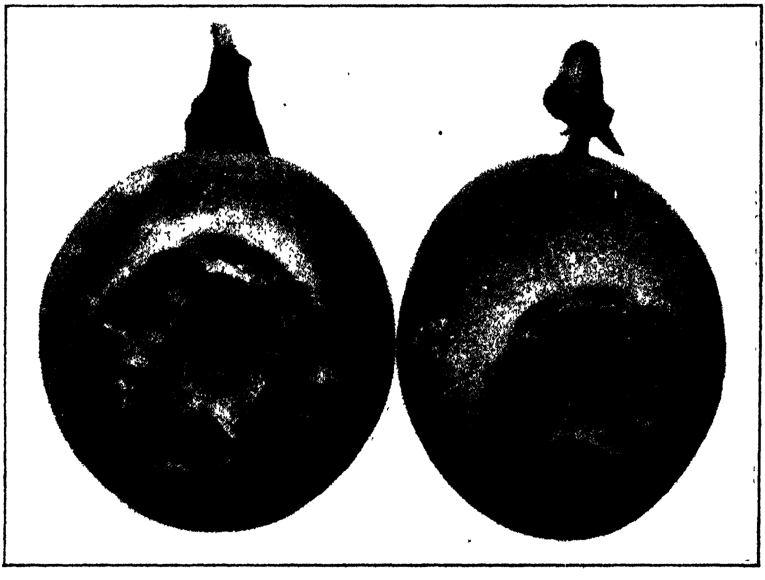


Fig. 34.—Two Ripe Fruits of the Black Passion, showing Effect of Brown Rot.

Growers experienced a severe visitation of the fungus in 1922, when relatively large quantities of fruit were destroyed. This followed a heavy fall of rain about the second week in February, when the vines were carrying a splendid crop of nearly-matured fruit, just prior to the time of ripening. In the absence of rains of any consequence, however, there was practically no appearance of the fungus during the 1923 fruit season. The leaves or fruit may be attacked at any time during their growth, and when climatic conditions specially favour the fungus, the bark may also become affected; and there is practically no limit to the number of spores that may find ingress to the different parts of the vine and its fruit.

The stems are sometimes attacked by Collar Rot (*Sclerotinia sp.*), which causes portions of the bark at the ground level to rot and peel off, often killing the vine, and always rendering the wood liable to become infested with white ants. The Root Fungus (*Armillaria mellea*) has also to be guarded against; this, after going through the different stages of growth, destroys the bark on the roots, and when its work of destruction is completed, the fructification of the fungus appears at the collar in the form of toad-stools Other fungi are also found on the vines, but those mentioned cause most of the damage of serious consequence.

TREATMENT—PREVENTIVE AND REMEDIAL.

These, being fungous organisms, are amenable to treatment by the recognised fungicides, and the sprays mostly used in combating them are Bordeaux Mixture and Lime-sulphur. In dealing with the diseases mentioned the preventive and remedial measures advocated for use against them respectively will be given in this order.

The preventive measures employed to minimize the chances of infection by Brown Spot consist of regularly collecting all badly-diseased fruits and boiling or burning same, and all prunings and diseased leaves should also be burned as pruning proceeds, and at other times when necessary. Good cultivation, manuring, &c., keeps the vines growing vigorously; this is always a helpful factor, and proper pruning to maintain young wood and admit light and air to all parts of the plant's superstructure, is also recommended. Applying the sprays mentioned above mostly constitutes the remedial treatment for this disease, and Lime-sulphur has, so far, given the best results. The first spray may be applied at the rate of 1 gallon lime-sulphur to 30 gallons water about the middle of November, when the young shoots on the pruned vines have grown a few inches long. The importance of also spraying, but with a weaker mixture (1 in 40 or 50), immediately after heavy rains occurring later during the fruit season cannot be too forcibly emphasized, because it is after those rains that the greatest quantities of fruit are destroyed. The spray kills the spores germinating on the leaves and fruit, and the deposit acts as a deterrent to others seeking an entry later. When Bordeaux Mixture is employed the 6-4-50 and 6-4-70 formulæ may be used respectively at the times recommended for the Lime-sulphur applications.

The attack of Collar Rot may be prevented by occasionally removing the soil, and particularly in early spring, from around the collar to a depth of about six inches, in this way allowing the sun to have full play on the bark for ten or twelve days. When the bark is thus made firm, dry and healthy, and enabled to resist the fungous spores, the soil may be returned to its original position. If, on examination, any of the bark at the collar is found to be diseased, the remedy is to scrape out the affected parts and spray these with strong Lime-sulphur, or Bordeaux Mixture, or paint the parts with Bordeaux Paste.

The Root Fungus being indigenous, is prevalent in many districts, and infects native trees and shrubs When grubbing a plot where this fungus is known to exist, the roots should be removed to a depth of at least eighteen inches, and the land should be cropped and worked for a year or two, so as to eradicate the fungus prior to planting the vines. As this disease operates underground, the method just suggested may be regarded as the only means that can be employed to prevent its infecting the passion plants.

If the disease be found to exist among passion vines, the remedy is to regularly remove the soil from the main roots of sickly vines, and if the presence of the disease be discovered, the roots should be sprayed with Bordeaux Mixture, 6-4-40, and the earth replaced.

EXPERIMENTAL SPRAYING.

The damage caused by Brown Spot in passions was only trifling prior to 1909, but in that year the losses as a result of its visitation were fairly severe. On account of this, the Department of Agriculture conducted spraying experiments in Mr. J. Hogg's garden, at Wandin, during the 1910 fruit season, Bordeaux Mixture, 6-4-50 and 6-4-70, being used. Two rows of vines were operated on. They were heavily pruned, and allowed to produce young shoots a few inches long before being sprayed in November. When the sprayed plants were examined in January, there was little or no spot to be found on them, and no damage was done to the foliage by either strength of mixture, both of which gave equal results. The unpruned and unsprayed vines in the same plot were at this time infected with spot.

Owing to the viperous virulence of the Glœosporium attack in 1922, and to satisfy the passion-growers' request, the Department arranged to carry out experiments again during 1923, to further test the relative efficacy of the different fungicides. Eight rows of vines or 72 plants of different ages were treated. These experiments were conducted in the gardens of Messrs. A. V. Strong and E. Mattingley, at Silvan; particulars of same are as follows:—

MR. A. V. STRONG'S PLOT.

Number of Row	Number of Vines.	Treated.	Material.	Formula.	Result.
1 ..	10 ..	16.11.22	Lime Sulphur	1 in 30 ..	No spots visible
2 ..	10 ..	„	„	1 in 35 ..	Slightly spotted
3 ..	10 ..	„	Bordeaux	6-4-50 ..	Slightly spotted
4 ..	10 ..	„	„	6-4-70 ..	More spotted than Nos. 2 and 3

MR. E. MATTINGLEY'S PLOT.

Number of Row.	Number of Vines.	Treated	Material.	Formula	Result.
1 ..	8 ..	17.11.22	Copper Soda	6-8-50 ..	Fairly effective
2 ..	8 ..	"	"	6-8-70 ..	Not as good as No. 1
3 ..	8 ..	"	Atomic Sulphur	1 lb. to 10 gls. water	No effect on spotting
4 ..	8 ..	"	"	1 lb. dusted on	No effect on spotting

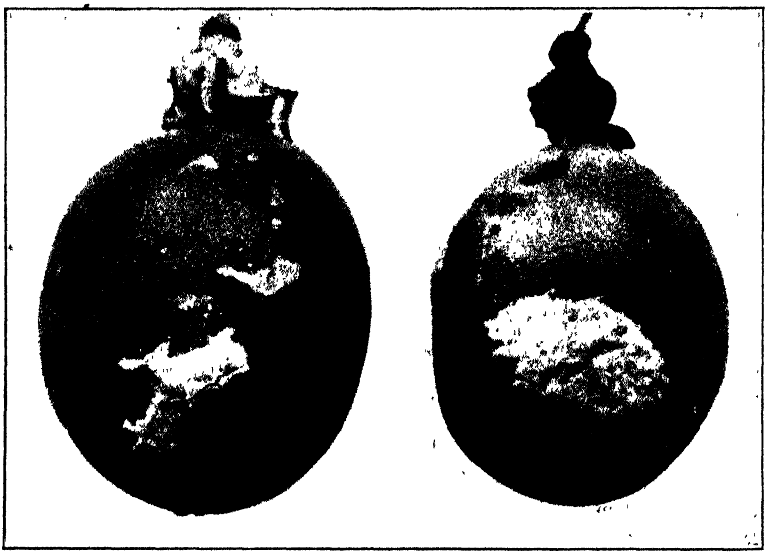


Fig. 35.—Two Ripe Fruits Affected by Woodiness.

Each plot consisted of consecutive rows, and the spraying and dusting were carefully done, the leaves and wood being covered. The treated vines were inspected on 15th February, 1923, and the results as given in the table noted, and a second examination on 9th March revealed no change to warrant any alteration in the order of results as shown. Lime-sulphur, 1 in 30, gave the best result, no spots being visible on the plants treated by this formula. The results from Lime-sulphur, 1 in 35, and Bordeaux Mixture, 6-4-50, were about equal, the leaves being slightly spotted in each case, and evidently Bordeaux, 6-4-70, is rather weak for use at this stage. Copper soda, 6-8-50, was fairly effective, giving a better result than that following the weaker formula of same. The eighth vine sprayed with Atomic Sulphur, as well as an equal number dusted over with this ingredient, were found to be as badly spotted as untreated plants in the garden.

The main objective, when commencing these experiments, was to find the best remedy for combating the February and mid-season attacks of the fungus after rains occurring at these times. The intention was to spray immediately after these rains with whatever material proved most effective earlier, so that the liquid might kill the germinating spores and leave a residue to destroy those finding a lodgment later. The object was frustrated, however, by the absence of rains, which although favoring the growers, may, from the experimentalist's point of view, be regarded as rather unfortunate. The trials will be resumed during the 1924 fruit season.

WOODINESS.

This peculiar development, the direct cause of which is unknown, appears only on the shell of the fruit. It is an abnormal growth on the outside of the capsule and protrudes slightly from the shell's surface; some affected fruits show only slight blemishes, while others may be covered with relatively large irregular patches These growths are at first soft, and of a light green colour, but get darker as development proceeds, until at the ripening they become coriaceous, hard, and almost white, as illustrated on the two ripe fruits appearing in Fig. 35. Woodiness, although retarding the growth of some specimens, does not seem to impair the quality of the pulp; but these unsightly blemishes detract considerably from the market value of the fruit. This disease, or rather, abnormal condition, although sometimes affecting a low percentage of the fruit on healthy, vigorous vines, is mostly found on that of delicate unpruned ones. Therefore, woodiness need not cause careful growers any alarm, and its absence from the garden is indicative of good cultivation, manuring, and pruning.

(*To be continued.*)

LARGE WHITE PIGS FOR BACON.

Large white pigs have never become popular in Australia, but are highly valued in England for prolificacy and bacon-making qualities. Mr. W. Hallas, of Warrington, England, has reported that a large white sow produced 51 strong, vigorous pigs in eleven months, and reared 40 of them in three litters. She farrowed 15 pigs on 17th December, 1921, and reared 13, two being killed as porkers at 79 days old, and weighed dressed 53 lbs. and 51 lbs. respectively. She farrowed again on 5th June, 1922, 19 pigs, rearing 15 (on 14 teats). Her third litter was farrowed on 10th November, 1922—17 pigs, of which 12 were reared.

PACKING OF FRUIT IN SOUTH AFRICA.

DISPLAY IN MELBOURNE.

By E. Meeking, Senior Fruit Inspector.

A small consignment of soft fruits was in February last shipped to Victoria by the South African house of T. J. Poupart Ltd. to Mr. Edmund W. T. Adams, Victorian representative of Messrs. T. J. Poupart Ltd., Covent Garden, London, Liverpool, Hull, Glasgow, &c.

The fruit was on exhibition for three days at the Produce Offices of the Department of Agriculture. It was not in any way a selection of the choicest fruit available, but was taken from an export consignment intended for shipment to London. It may therefore be regarded as showing the methods usually adopted by exporters in shipping fruit from South Africa to London.

The shipment consisted of fifteen trays of peaches, plums, and pears, made up as follows:—

Peaches.

Size of Boxes—12″ x 18″ x 3″.

Variety.	Grade.	Style of Pack.
1 Case "Schoongezecht"	Selected	3 x 4 21 peaches to tray.
2 Cases ,,	"Choice"	4 24 ,, ,,
2 ,, ,,	,,	4 28 ,, ,,

Plums.

Size of Boxes—12″ x 18″ x 2½″.

Variety.	Grade.	Style of Pack.
2 Cases "Apple Plum"	Selected	5 x 5 45 plums to tray
3 ,, ,, ,,	"Choice"	6 x 5 55 ,, ,,

Pears.

Size of Boxes—12″ x 18″ x 3″.

Variety.	Grade.	Style of Pack.
2 Cases "Bon Chretien"	Selected	4 x 3 25 to tray
3 ,, ,, ,,	,,	

Packing.

Each fruit (peaches, plums, and pears) was separately wrapped in absorbent tissue paper, which bore the grower's brand and the locality in which the fruit was grown (as per illustration, No. 1). The wrapper was placed around the fruit in such a manner as to show the brand on the top of the fruit, so that when the boxes were opened, the brand was prominently displayed.

The method of packing is well shown in illustration No. 2. A "nest" of wood-wool was provided by lining the bottom of the boxes with a fairly thick layer; and the peaches were separately "nested", so that each individual fruit was insulated from its neighbour by a thin surrounding layer of wood-wool. The plums and pears were packed with the fruits adjoining each other, and all fruits, whether peaches, pears, or plums, were provided with a layer of wood-wool on the top, that is, between the lid of the tray and the fruit. The wood-wool was of very fine texture, white, and more finely cut than that at present generally used by the trade in Australia. It resembled in texture and quality the material used by many of our exporters before the war, and known in the trade as " aspen " wood-wool.

Boxes.

These (Illustration No. 3) consisted of trays, constructed of white pine wood, imported into South Africa from Sweden, and were fastened on top by strips or cleats of wood ⅜ inch wide and ½ inch deep. The nails to hold these also sufficed to hold the tops of the trays to the ends. The lids were not fastened to the trays along their side edges, and the sides of the trays were shallower in depth than the ends, with the lids and bottoms not quite wide enough to cover the end pieces. This construction allowed a small space around the edges of the tray and in the middle of both top and bottom, and provided ventilation between the top edge of the tray and the whole length of the lid. This method, in addition to the before-mentioned cleats, ensured a good circulation of air to the fruit during transit.

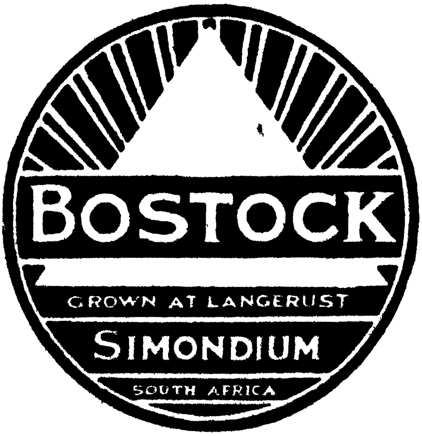


Fig. 1.—Paper Wrapper used in South Africa.

The following statement, showing the measurements of the timber from which the trays were constructed, will serve as a guide to those Victorian growers who wish to adopt cases of a similar type for shipping soft fruits:—

Tops and bottoms—Two boards each: 5⅜ inches wide x 18 inches long x 3-16th inches thick.

Sides—One board each: 3½ inches wide x 18 inches long x 3-16th inches thick.

Ends—One board each: 3¾ inches deep x 11½ inches wide x ⅜ inches thick.

The plum trays were one-half inch less in depth.

Cleats—½ inch thick x 11½ inches long x ⅜ inches wide.

It may be mentioned that these trays are of the same sizes and constructed in the same manner as trays in use in the United States for the marketing of soft fruits. The cleats particularly are intended to act as a buffer to protect the fruit when several trays are stacked for

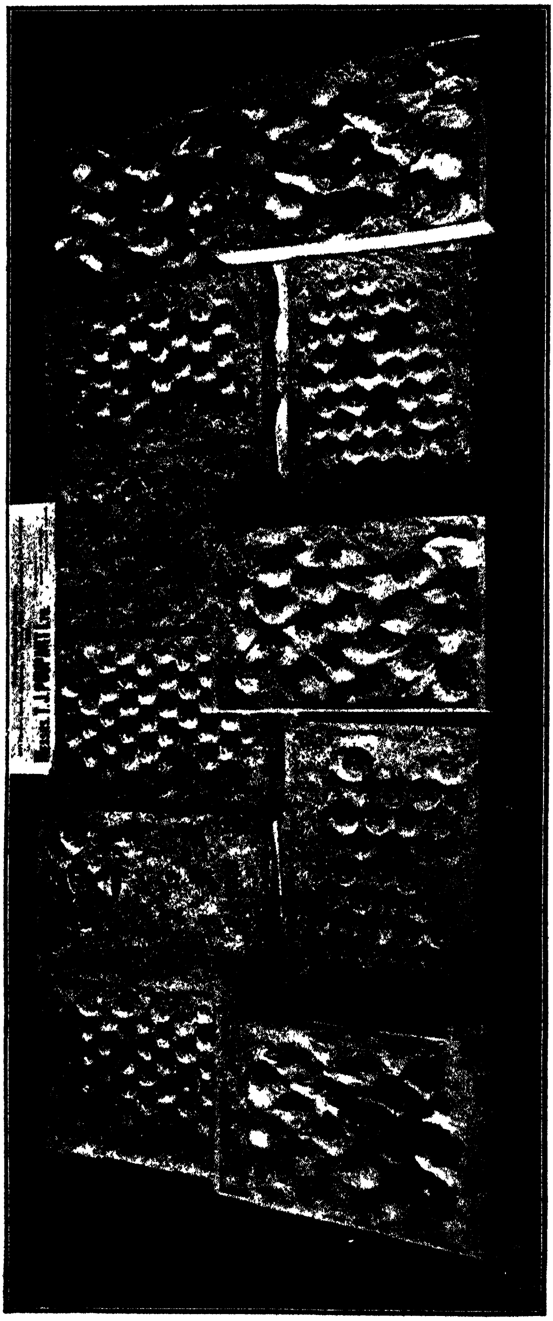


Fig. 2.—Consignment of Fruit Shipped from South Africa to Victoria in February last.

transport or storage. They also further facilitate the free circulation of air in ship's cool chamber.

Branding.

The trays were each branded at one end with a neat white label, covering the whole end of the tray, and bore the following information: Number of pieces of fruit; description; shipper's brand; name of the grower and packer; and Government Fruit Inspector's stamp. These details are shown in illustration No. 3. The consignee's brand or shipping mark was stencilled at the other end of the tray.

SPECIAL POINTS OF INTEREST.

The fruit was picked about the beginning of January, 1923, and was shipped per s.s. *Diogenes*, which arrived in Melbourne on 15th February. All orchards in Cape Colony are within a radius of 120 miles from Cape Town. The pears were grown by Louis Sarenbeck, at Verebest, Ceres, Cape Province, which is about 95 miles from Cape Town; while the plums and peaches were grown by Arthur Bostock, at Langereest Farm, Simondium, Cape Province, about 35 miles from shipping port.

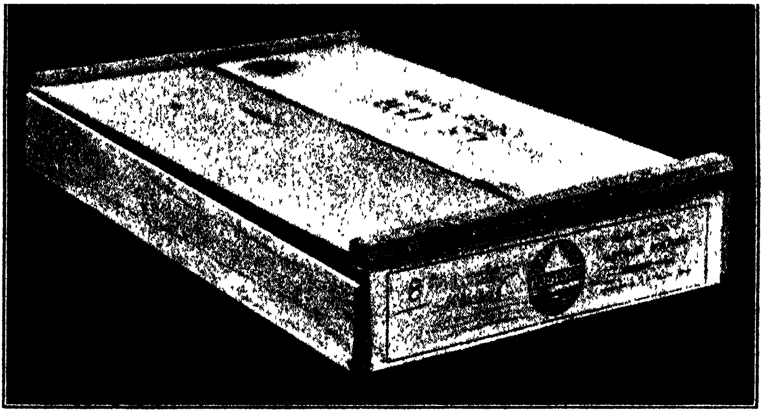


Fig. 3.—Fruit Tray used by South African Fruit-growers.

From the orchards in Cape Colony fruit is railed to Cape Town, where, as required by the South African Government regulations, it must be pre-cooled in cold store for at least forty-eight hours prior to shipment. No other special treatment is given beyond careful picking, packing, and handling. Insulated trucks are not generally used to transport fruit to sea-board. The time which elapses between the picking of the fruit and shipment varies according to circumstances. Sometimes the period is only five or six days, sometimes it is held in cool stores at docks for two or three weeks if shipping space is not available. The fruit is picked in the morning, after the dew has gone off, up to 10 or 11 o'clock. It is placed in a cool shed or shaded place and packed in the late afternoon. The more careful growers make their pickers and packers wear gloves to avoid nail scratching or puncturing of fruit.

The fruit is picked into carrying trays in the orchard, and then carried to the packing-house, where it is sorted into the various grades.

The fruit is supposed to be carried during the sea voyage at a temperature of from 34° to 36° Fahr. No distinction in this respect is made between the different varieties of fruit.

South African Costs.

The following statement of costs will be of interest to Victorian growers, who will be enabled to make a comparison of these with costs in this State:—

Boxes—2½ inches in depth: £14 15s. per 1,000.
,, 2¾ inches in depth: £15 per 1,000.
,, 3 inches in depth: £15 7s. 6d. per 1,000.

All the boxes are of uniform dimensions—12 inches wide and 18 inches long.

Wood-wool: £15 per ton.

The foregoing prices are c.i.f. Cape Town. About 30 per cent. should be added to cover import duty and landing charges.

The picking is usually done by coloured labour and the packing by white labour, but in some instances orchardists have trained their coloured labourers into expert packers. Coloured labourers get about 4s. per day. A good white packer gets 10s. per day. An expert packer is expected to pack from 150 to 200 boxes (trays) per day.

Rail freights are from 7d. to 1s. per 100 lbs. Ocean freights (per cubic ton of 40 ft.) to England:—Peaches and plums, 65s.; pears, 60s. Peaches are reckoned at 90 boxes, plums 85 boxes, and pears 75 boxes to the ton. These work out per tray as follow:—Peaches, 8.66d.; plums, 9.17d.; and pears, 9.6d.

Packing in Trays Urged.

This method of packing soft fruits for export as attractively as possible in individual trays, instead of in bushel or half-bushel cases, has been advocated by the Victorian Department of Agriculture for the past twelve years. Unfortunately few Victorian growers have not seen fit to follow this advice, having apparently been influenced by the greater initial expense which would be incurred. A great opportunity has consequently been lost to our growers of establishing a profitable export trade in pears and plums, and of being first in the field, as South Africa has built up her present trade inside the period mentioned.

It is even now not too late to share in the trade, and provided the proper methods of selecting, packing, and transporting are strictly observed, soft fruits, such as pears, plums, and possibly peaches, should be successfully exported in large quantities to the United Kingdom.

The prices which would be realized should well repay the extra initial expense which would be incurred by strict attention to necessary details, such as careful selection, picking, and packing of fruit; proper handling and stowage during transport; pre-cooling prior to shipment, and the maintenance of proper temperature and ventilation in ocean transit.

Even with the handicaps of longer sea transit and higher freights as compared with South Africa, there is good reason to believe that

Australian growers could profitably share in supplying the British markets with soft fruits.

By comparison with the fruit in the shipment under notice, Victorian fruit is of better flavour and general quality than the South African. This was particularly noticeable so far as peaches and plums were concerned.

It is to be regretted that our growers do not give justice to their fruit by preparing it for export in the attractive manner which its quality demands.

Conclusion.

Messrs. T. J. Poupart Pty. Ltd. and their resident agent (Mr. E. W. T. Adams) are to be congratulated on their disinterested enterprise in sending this consignment to Australia for the benefit and information of fruit shippers. Much valuable information has also been received from Messrs. T. J. Poupart Ltd. in connexion with the experimental shipment of apricots, peaches, and plums shipped from Victoria per the s.s. *Hobson's Bay* at the beginning of January last; and Mr. W. Ravenhill, a director of the firm, has sent full details as to the methods of packing, &c., which should be adopted when shipping soft fruits. This advice is in accordance with the methods which were carried out in connexion with the shipment sent to Australia from South Africa.

SOUTH AFRICAN FRUIT EXPORT REGULATIONS.

For the information of Victorian growers an extract from the South African regulations governing the export of fruit from that country is printed hereunder. These are interesting in many respects, particularly as showing that the Union has seen fit to enforce standard grading and packing for certain fruits, and to compel the pre-cooling of these prior to shipment.

South Africa has already established a large trade in the export of soft fruits (peaches, pears, and plums); is a formidable rival of Australia in the export of citrus fruits; and, according to reliable statistics regarding the planting of apple trees in Cape Colony during recent years, will shortly be a keen competitor in the export of apples.

Every person who intends to export fruit from the Union to a place outside the limits of the Union, but not declared by Proclamation No. 143 of 1914 to be an exempted place, shall give notice of such intention to the Government Fruit Inspector at Cape Town, Mossel Bay, Port Elizabeth, East London, or Durban (as the case may be).

For each consignment of fruit examined by the the Inspector the exporter shall pay at the rate of one shilling per 40 cubic feet on all boxes going twenty-five or less to the ton, and one shilling and sixpence on all boxes going over twenty-five to the ton. (For deciduous fruit, extra 5s. per 40 cubic feet after 21/12/21).

The following fruits shall be packed in boxes the size of which shall be:—

	Outside Measurement.
(*a*) For pears, peaches, nectarines, apricots, plums, grapes.	10 by 12 inches or 24 by 18 inches, the depth being optional.

Grapes may, however, be shipped in crates which shall be a multiple of the grape box mentioned under (*a*), and Almeria grapes may be shipped in barrels or boxes of other measurements than the above.

	Outside Measurement
(*b*) For apples, beginning with 1916 shipments	20 by 11 by 10 inches.
(*c*) For pineapples, Cayenne variety Giant Kew, Queen variety	27 by 16 inches, depth optional, 27 by 14 inches, depth optional.
The standard orange box may also be used for pineapples.	
(*d*) For citrus fruit:—	
Oranges	26 by 12½ by 12½ inches or 26 by 12½ inches. (Depth optional) for single-layer boxes only.
Naartjes	18 by 12 inches, depth optional, and 24 by 12 by 6 inches for half boxes.

All fruit shall be cleated on the top.

Every box of fruit submitted for inspection shall be clearly marked, on one end thereof, with

(*a*) the registered mark of the exporter (or his name or other means of identification).

(*b*) the variety and the kind of fruit, the grade thereof; and the exact number of fruit contained in the box.

(*c*) in the case of loose-skin or green-skin naartjes, the word "loose-skin" or "green-skin" as the case may be:

(*d*) in the case of grapes, the net weight after allowing 5 per cent. for shrinkage.

Every box of fruit submitted for inspection must be consigned to the Dock Goods Superintendent, Cape Town; the Goods Agent, Mossel Bay; the Port Goods Manager, Port Elizabeth; the Port Goods Superintendent, East London; or the Port Manager, Durban direct, or to him through an agent, and bear on the top of the box the shipping mark of the agent appointed by the exporter to dispose of his fruit oversea.

(*a*) Each apple, pear, peach, nectarine, plum, apricot, citrus fruit, and mango shall be wrapped in or surrounded by tissue or other more or less similar paper.

(*b*) Grapes, except Almeria grapes, shall be wrapped in or surrounded by suitable paper.

All fruit, excluding apples and citrus fruits, may be placed in wood-wool or cork dust (in the case of Almeria grapes only) or other material considered by the Department of Agriculture to be suitable packing.

Artificially colored wood-wool is not recommended.

All fruit shall be in sound condition, fully developed, not too unripe, free from disease, bruises, cuts, or from other blemishes affecting its appearance, and be of the characteristic shape of its variety. At least one inch of stalk shall be kept on the Cayenne pine and one half-inch on the Queen, and the whole crown shall be left on the pine in as perfect conditions as possible.

All fruit in one box shall be of uniform size and of one variety; except fruit consigned to private order, in which latter case the box shall be marked on the end thereof "private order."

(*a*) All fruit other than citrus and pine fruits and other than fruit intended to be shipped in ventilated hold shall forty-eight hours previous to shipment, be in a cold store approved by the Department of Agriculture, and in the case of fruit placed in a private cold store so approved the exporter or his agent shall produce to the Inspector a certificate to that effect signed by a person approved by the said Government for the purpose.

(*b*) Fruit placed in private approved cold storage at the port of shipment will be inspected by the Inspector of such stores, provided that forty-eight hours' notice be given to the Inspector by the exporter or his agent. Fruit so stored shall be conveyed to the harbor in refrigerated trucks.

(*c*) Citrus and pine fruit shall be delivered for inspection not less than twenty-eight hours prior to the sailing of the vessel by which the exporter intends such fruit to be shipped.

The following shall be the grades for the fruits mentioned. Owing to shrinkage it is recommended that, when packing, exporters grade all fruit half an inch larger than the sizes mentioned:—

(*a*) APPLES.

No grades are fixed, but varieties ripening prior to Ribstone and Jonathan, with the exception of Five Crowns, Irish Peach, Tomm Putt, and Colville Aromatic, are not recommended for export.

(*b*) PEARS.

Variety.	Extra Selected (Diameter).	Selected (Diameter).	Graded (Diameter).	Lowest Grade (Diameter).
Bon Chretien	2¾ in.	2½ in.	2¼ in.	Below 2¼ in.
Doyenne de Comice	3 in.	2¾ in.	2½ in.	,, 2½ in.
Louise Bonne	2½ in.	2¾ in.	2 in.	,, 2 in.
Beurre Bosc	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Winter Nelis	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Beurre Hardy	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Glou Morceau	3 in.	2¾ in.	2½ in.	,, 2½ in.
Clapp's Favorite	2 in.	2½ in.	2¼ in.	,, 2¼ in.
D'Angoulême	3½ in.	3 in.	2¾ in.	,, 2¾ in.
Beurre Diel	3½ in.	3 in.	2½ in.	,, 2½ in.
Gansel's Bergamot	3 in.	2½ in.	2¼ in.	,, 2¼ in.
Josephine	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Beurre Superfine	2¼ in.	2½ in.	2¼ in.	,, 2¼ in.
Flemish Beauty	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Rustenburg	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Forelle	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Magnate	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
Clairgeau	3 in.	2¾ in.	2½ in.	,, 2½ in.
Durondeau	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.

(*c*) PEACHES.

Variety.	Extra Selected (Diameter).	Selected (Diameter).	Graded (Diameter).	Lowest Grade (Diameter).
Elberta	2¾ in.	2½ in.	2¼ in.	Below 2¼ in.
Early Rivers	2¾ in.	2½ in.	2¼ in.	,, 2¼ in.
All other varieties	2½ in.	2¼ in.	2 in.	,, 2 in.

All varieties shall, as far as possible, be shipped under their own names, and where not described shall be marked "Cape Freestone Peaches" with the exception that all early ripening varieties of similar appearance—such as Hale's Early, High's Early, Canadian, Brigg's Red May, Waterloo, and Early Alexander—may be classed as "Alexanders."

Boxes containing yellow-fleshed peaches must be marked "Yellow-flesh" on the end of the boxes, under the name of the fruit.

Clingstone varieties and Mamie Ross are not recommended for export, but the receptacle of any exported shall be marked "Graded," and shall not be marked by any other grade term. The word "Clingstone" shall, in addition, be printed on the box below the name of the fruit.

(*d*) NECTARINES.

Variety.	Extra Selected (Diameter).	Selected (Diameter).	Graded (Diameter).	Lowest Grade (Diameter).
All varieties	2¼ in.	2⅛ in.	1⅞ in.	Below 1⅞ in.

Clingstone varieties are not recommended for export.

(*e*) APRICOTS.

Variety.	Extra Selected (Diameter)	Selected (Diameter).	Graded (Diameter).	Lowest Grade (Diameter).
All varieties except Early Cape ..	2⅛ in.	2 in.	1⅞ in.	Below 1⅞ in.
Early Cape varieties	2 in.	1⅞ in.	1¾ in.	„ 1¾ in.

All varieties shall, as far as possible, be shipped under their own names and, where not described, shall be marked "Cape Apricots."

(*f*) PLUMS (Japanese).

Variety	Extra Selected (Diameter).	Selected (Diameter)	Graded (Diameter)	Lowest Grade (Diameter).
Satsuma	2¼ in.	2 in.	1¾ in.	Below 1¾ in.
Kelsey..	2½ in.	2¼ in.	2 in.	„ 2 in.
Wickson	2⅜ in.	2⅛ in.	1⅞ in.	„ 1⅞ in.
Apple	2¼ in.	2 in.	1¾ in.	„ 1¾ in.
Sultan	2¼ in.	2 in.	1¾ in.	„ 1¾ in.
Simoni	2½ in.	2⅛ in.	1⅞ in.	„ 1⅞ in.
Chalco	2¼ in.	2 in.	1⅞ in.	„ 1⅞ in.
Burbank	Nil	2⅛ in.	Nil	„ 2⅛ in.
All other varieties	2¼ in.	2 in	1¾ in.	„ 1¾ in.

Of the Sultan variety, only the first crop is recommended for export.

PLUMS (Varieties other than Japanese).

Variety.	Extra Selected (Diameter)	Selected (Diameter).	Graded (Diameter).	Lowest Grade (Diameter)
All varieties	2 in.	1½ in.	1¼ in.	Below 1¼ in

(*g*) CITRUS FRUITS.

Oranges shall be packed so as to contain in the box of 26 by 12½ by 12½ inches (outside measurements) standard packs of 80, 96, 112, 126, 150, 176, 200, 216, 226, 252 oranges, as the case may be, or such additional standard packs as may be prescribed by notice in the *Gazette*.

NAARTJES.

GRADES.

Extra Selected	Selected	Graded
Not less than 2½ in. in diameter.	Not less than 1½ in. in diameter.	Less than 1½ in. in diameter.

The receptacles of "loose-skin" and "green-skin" naartjes shall be marked "Graded," and shall not be marked by any other grade term.

In addition to the foregoing classes of fruit, grade standards are also provided in the regulations for grapes, pineapples, melons and mangoes.

Boards of Reference are established, to which an exporter may appeal if the Inspector refuse to brand or stamp any box of fruit belonging to such exporter.

A fee of ten shillings shall be deposited by the consignor with the Inspector in respect of each consignment of fruit which the consignor may require the Inspector to obtain the decision of the Board of Reference upon, under the provisions of section five of the Act.

Boxes of fruit marked so as to represent a grade higher than the correct grade shall be re-marked by the Inspector, and, if otherwise complying with these regulations, branded or stamped by the Inspector as provided in section four of the Act.

Not less than five per cent. of the boxes of fruit in each consignment shall be opened by the Inspector for examination, and all boxes so opened shall be stamped by the Inspector to that effect.

Only new and clean boxes or packages shall be used by exporters, except in the case of melons.

COOL STORAGE OF TOMATOES.

Experiments in Keeping Qualities.

By D. B. Adam, B. Agr. Sc., Department of Agriculture.

Some experiments were carried out last year with fairly green tomatoes, packed in bran, and stored at 32° F. Though the fruit remained firm and sound, it did not develop either colour or flavour. This year experiments were made with half, three-quarter, and fully ripe fruit. A case in each condition was stored at 35° and 33° F. The relative merits of the direct expansion and air circulation systems, and a combination of the two, were also tested. A later consignment from another district was stored at 31° F.

All fruit when received was in excellent condition, being firm and free from disease. It was noted, however, that some of the fruit had been plucked, so that the whole stalk, together with the persistent calyx, had remained on the vine. It is desirable to leave a short piece of the stalk on the fruit, as this protects the stalk end from injury. If no stalk be left with the fruit, the process of picking produces an injury through which fungal infection may take place.

The fruit was received on the 9th March, packed in flat bushel cases. It was examined at frequent intervals. After three weeks mould development was noted about the calyx end of the tomatoes stored in the direct expansion chamber at 35° F. Within another week fruit stored in the other two chambers at 35° F. showed signs of mould development.

Soon after the first development of mould the fruit began to get soft, even in parts remote from the points of mould infection. This softening was due to the layer immediately beneath the epidermis losing its rigidity. Concomitantly with this softening, which at first was irregularly localized, but soon became general, moulds spread rapidly, and the fruit, if handled at all, broke up very easily.

Ripe tomatoes will soften more rapidly than three-quarters, medium ripe, or half ripe tomatoes. Green fruit remains firm for the longest period. On the other hand a ripe tomato, while it is sound in store has the best flavour, followed in order by the three-quarter ripe and half ripe fruit.

The second consignment, which was received three weeks later than the first, was stored at 31° F. While in this lot the extent of infection after a definite period was apparently less than in fruit stored at 33° or 35° F., yet some fruit showed evident infection after a three weeks' storage period.

In all cases moulds developed rapidly on the removal of fruit from store. The tomatoes in the second consignment did not show softening after such a short period as did those stored at 35° F. This, however, may have been due to a difference of maturity and not to a difference in temperature, since the fruit was supplied by a different man, from a different district, and at a different time.

A species of *Alternaria* is the main cause of loss. With this particular fungus an injury to the epidermis is necessary before the disease can affect the fruit. It should be pointed out that under favorable conditions limited development takes place on the surface of the fruit; particularly is this growth found around the calyx. The fruit itself is not affected. The fungus may be rubbed off, and the epidermis will be seen to be entirely free from disease.

These experiments indicate that in each instance the storage life was limited by the development of mould. In picking and storing tomatoes the following should be borne in mind:—

(1) The fruit should be picked when three-quarters ripe, since at this time, while it has a good flavour, it is still firm, and can stand some handling.

(2) Care must be exercised in picking and subsequent handling in order to prevent bruising, and a small portion of the stalk should be left attached to the fruit.

(3) 33° to 34° F. is a satisfactory temperature.

(4) The humidity should be kept as low as is practicable with these temperatures. Air movement in the chamber should be encouraged, as this tends to check mould development.

Soon after the positive development of mould a progressive softening, previously mentioned, apparently due to internal chemical changes, takes place. If fruit which has commenced to soften be removed from store its subsequent break-down is rapid. Here it should be remembered that fully ripe fruit was the first to show signs of softening, followed by the next ripest, and so on. This advantage, however, is set off by the fact that the riper the fruit is the better is the flavour developed. If the middle way be chosen, then a fruit three-quarters ripe gives the most general satisfaction.

Two varieties of tomatoes were also tested. The results did not show any difference in actual storage life. Both varieties deteriorated after three weeks owing to the development of mould.

Summary and Conclusion.

1. The storage life of tomatoes is limited in the first instance by the development of moulds.

2. Efforts should be made to minimise this deterioration by care in picking, handling, &c., and by cool storage practice, which should be directed to obtaining humidity conditions unfavorable to the development of moulds.

3. Soon after the advent of mould development, softening takes place—a condition dependent to some extent on the maturity of the fruit. Softening appears to be the result of internal chemical changes. If so, it may limit absolutely the cool storage life of tomatoes.

4. The successful storage of tomatoes is thus possibly limited to short periods. If handled carefully, storage for a maximum period of three weeks might be possible. In the majority of cases a week or ten days is all that could judiciously be allowed.

5. Cool storage, however, should not be without its use in helping to solve our sometimes frequent tomato gluts.

POULTRY-FEEDING TESTS.

At the State Research Farm, Werribee, a series of poultry-feeding tests were commenced on 1st April, 1923, and will be concluded on 31st March, 1924.

One hundred and eight white leghorns were selected and divided into three pens of thirty-six birds each. None of the birds chosen was bred from a single mating—the object being to test only birds of the quality that may be found in an ordinary farm flock. The birds in the three pens are housed and treated in exactly the same way excepting for the feed given.

No. I.—*Free Choice Pen.*—These birds have all the foods in different hoppers always available. A wire basket is kept filled with green stuff always before them.

No. II.—*Dry Mash Pen.*—There is a dry mash hopper always open in this pen. Chaffed green stuff is fed to these birds at midday, and grain in the litter at night.

No. III.—*Wet Mash Pen.*—The birds are fed with a wet mash in the morning, chaffed green stuff at midday, and grain is fed in the litter at night.

The following are the results obtained up to the 31st July last:—

Table Showing Food Consumed and Eggs Produced.

Month.		Bran.	Pollard.	Barley Pollard.	Oat Pollard	Meat Meal.	Wheat	Oats.	Barley	Crushed Maize	No. of Eggs Produced.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	
						Free Choice Team.					
April	..	12	25	½	½	..	72	41¼	24¾	17	419
May	..	13¼	20	½	¼	..	96¾	32¼	21¾	26½	329
June	..	11¾	9½	2	¼	2½	54	48	14	37½	292
July	..	12¾	10¾	..	3½	11½	98	22¾	11¼	51¾	434
		49¾	65¼	3	4½	14	320¾	144¼	71¾	132¾	1,474
						Dry Mash Team.					
April	..	14	23½	..	..	3¾	83	18½	18½	..	281
May	..	13¾	23½	..	..	3½	108	22	22	..	287
June	..	15¾	31¾	..	..	5¾	109	25	..	18½	230
July	..	25¾	43½	..	..	10½	111	35	..	10	387
		69¼	122¼	..	..	23½	411	100½	40½	28½	1,185
						Wet Mash Team.					
April	..	25	40	..	..	4½	88	19½	19½	..	398
May	..	29½	49	..	..	10½	96	20	20	..	372
June	..	30	48	..	..	13½	88	20	..	14½	256
July	..	30	50	..	..	16	95	30	..	9	419
		114½	187	..	..	44½	367	89½	39½	23½	1,445

STALLION REGISTER 1923-24

under the "Horse Breeding Act 1919."

(Part I.—Registrations prior to 6th July, 1923.)

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
239	Abbey Mack ..	A	Light ..	W. Lowe ..	Hamilton
459	Abbot's Best ..	A	Draught ..	J. Egan ..	Bobs Camp, Barwite
240	,, Pride ..	A	,, ..	W. H. Gadd ..	The Glen, *viâ* Wodonga
458	Active	A	Thoroughbred	G. Brown ..	Bennison
146	Admiral Howard ..	A	Draught ..	W. G. Holland ..	Sheep Hils
76	Admiral Speary ..	A	,, ..	C. Hill ..	Gama P.O.
198	,, Sperry ..	A	,, ..	Alex. Duff ..	Baringhap
138	Advance	A	,, ..	A. W. Brown ..	Speed
457	Aird Laddie ..	A	,, ..	E. Yeaman ..	P. B. Echuca
263	Albion	A	,, ..	J. Oakes ..	Nathalia
53	Al. Borak ..	A	Light ..	L. Bennett ..	Nullawil
342	Alex. R.	A	,, ..	E. Charles ..	Ultima
287	All Black	6	,, ..	W. Morey ..	Katandrah
137	,, Style	A	,, ..	R. Midchett ..	Bendigo
136	Ambershine ..	A	,, ..	L. A. Gunsser ..	27 Durham-st., Ballarat West
22	Amberstain ..	A	,, ..	J. L. Cumming ..	Berrimal
550	Angle Jack ..	A	,, ..	C. T. Hillas ..	Double Gully, Tallangatta
503	Aristocrat .	A	,, ..	R. Price ..	Wallacedale South
456	Assembler ..	A	,, ..	J. Ferguson ..	52 Peel - street South, Ballarat East
454	Attractions Champion	A	Draught ..	Wm. Morley ..	Rutherglen
199	Avonlea	A	,, ..	Jas. Leitch ..	Wodonga West
551	Axedale Prince ..	A	,, ..	J. McDonald ..	Barrakee North
295	Bannockburn ..	A	,, ..	G. W. Francis ..	Lower Norton, *viâ* Horsham
390	Barbour II. ..	A	,, ..	T. McClelland ..	Birchip
455	Barney II. ..	A	Light ..	A. W. Thomson	"Monivar," Hamilton
213	Baron	A	Draught ..	M. Murphy ..	Rupanyup
334	,, Bombay ..	A	,, ..	Shiels Bros. ..	Youanmite P.O.
173	,, Clyde ..	A	,, ..	Cunnington Bros	Bamawm
54	,, Crombie ..	6	,, ..	A. P. Johnston ..	Colbinabbin
299	,, Fenwick ..	A	,, ..	W. Gardiner ..	Waaia
286	,, ,, ..	A	,, ..	H. C. Wilson ..	Yarrabert - st., Raywood
219	,, Juno ..	A	,, ..	Manifold and Co.	Purrumbete, Weerite
327	,, Lee ..	3	,, ..	J. R. Stokes ..	3 Bloomberg-st, Abbotsford
147	,, McKie ..	A	,, ..	J. A. McDougall..	Cosgrove
104	,, McLean ..	A	,, ..	D. W. Stewart ..	Logan
495	,, McLeod ..	A	,, ..	David Mitchell Estate	Lilydale

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age Yrs.	Class.	Owner.	Address.
184	Baron Major	3	Draught	Department of Agricultural Research Farm	Werribee
103	,, May	6	,,	H. D. Oberin	Goornong
112	,, of Dalmore	A	,,	J. R. Henty	Pakenham
289	,, Stanley	A	,,	P. F. Cantwell	Tooronga, Mt. Egerton
37	,, Stewart	A	,,	J. W. Hansen	Baulkamaugh
590	,, Style	5	,,	A. J. A. Browne	Werribee
221	,, Watson	A	,,	Manifold and Co.	Purrumbete, Weerite
290	,, Wattee	6	,,	F. Nagorcka	Tarrington
223	,, Weerite	A	,,	Manifold and Co.	Purrumbete, Weerite
172	Baron's Idol	A	,,	J. Carmichael, jun.	Aah Park, *viâ* Mulwala, N.S.W.
543	,, Reserve	A	,,	E. J. McCabe	Mallee Downs, Gerang
473	,, Royal Chief	A	,,	T. E. Parry	Coonooer Bridge
331	,, Superior	A	,,	W. Bransgrove	Norrim North
12	Barony	A	,,	R. A. Martin	Navarre
472	Basil B.	A	Light	W. A. Riedill	Longala
174	Bawnmoor	A	,,	Jessa Singh	Nyarrin
544	Bay Harold	A	,,	A. Sutherland	10 Palmer-st., Oakleigh
546	Beaconsfield Flyer	A	,,	A. E. Harding	Whorouly South P.O.
343	Bell Boy	A	,,	T. Bandy	Waubra
241	,,	A	,,	A. G. Turnbull	Winton, Horsham
148	Belmont Again	6	Draught	W. A. Creighton	Alexandra
569	,, Chimes	A	Light	C. S. Walker	Swan Hill
397	Berkeley Bantam	A	Pony	R. Crozier	South Morang
242	Bickie	A	Light	A. G. Turnbull	Winton, Horsham
102	Black Imp	A	Pony	F. M. Orton	Murmungee
88A	,, Prince	A	,,	Thos. Gaudio	Thoona
508	,, Tom	A	Light	A. Potter	Naroghid
2	Blainwood	A	,,	H. Gregersen	Benalla
55	Bobby	A	Pony	Geo. Officer	Woolthorpe
453	Bobniak	A	Light	H. F. Clarke	Miepoll, *viâ* Euroa
101	Bold Action	6	Draught	E. Pearce	Rupanyup
285	,, Agitation	A	,,	Chamberlain and Ritchie	Morwell
135	,, MacGregor	A	,,	W. McNaughton	Walpeup
452	,, Rowan	A	Light	A. L. Turnbull	Sebastopol, Ballarat
447	Bon Wickliffe	A	,,	Jas. Ford	Wickliffe
56	Bonnie Wizard	A	Pony	J. J. Cox	Nathalia
504	,, Scotchman	A	Draught	R. Price	Wallacedale South
82	Bower Bank	A	Light	John O'Bree	Piangil
212	Bramhope Monarch	A	Draught	G. Hicks	Miram
57	,, Paladin	A	,,	W. H. Alford	Modewarre P.O.
81	Brassey's Pride	6	Pony	A. E. Millar	Hopevale
19	Breastknot	A	Draught	W. J. Moll	Dimboola

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age. Yrs.	Class.	Owner.	Address.
451	Brigham Again	A	Pony	J. Barns	Euroa
564	Bright Star	A	„	J. T. Neeson	Chetwynd
381	Briton	A	Draught	P. Petersen	Cravensville
340	Briton's Pride	6	„	A. Cameron	Karnak, *viâ* Goroke
211	Bronte's Pride	A	Pony	J. V. Hosking	Towaninnie
552	Bronzewood	A	Thoroughbred	Quinlan Bros.	Oaklands Junction
450	Buchlyvie's Choice	A	Draught	W. J. Westendorf	Dimboola
284	Bundoran	A	Light	A. Graham	Bacchus Marsh
474	Bute Laddie	A	Draught	Crawford Bros.	Linwood, Tatura
58	Calais	A	Light	G. Officer	Woolsthorpe
572	Camperdown	A	Pony	W. J. Clark	Sunbury
59	Canny	6	Thoroughbred	T. A. Griffiths	Glenrowan
149	Cape Sky	A	„	G. Buckley	Wickliffe
194	Captain Douglas	5	Draught	C. S. Rodda	P.B., Warracknabeal
243	Carmichael	6	„	J. A. Pearse	Glenrowan West
527	Carovita	A	Pony	W. F. Clarke	Heyfield
75	Cedric	A	Draught	S. L. Moodie	Ardoon, Warracknabeal
449	Chal	A	Thoroughbred	T. J. Scott	Everton
378	Chenard	6	Light	W. T. Carter	Coleraine
23	Cicero	A	Draught	R. Lloyd	Kyabram
317	Clan Fingen	A	Thoroughbred	Ned's Corner Company	Mildura
9	Clarey	A	Pony	J. Jones	Mywee
65	Claymore	A	„	J. P. Hanrahan	Ballan
464	Clem	A	„	M. Skeyhill	Weerite
283	Clyde Boy	A	Draught	H. Goldsmith	Corack
567	„ Laddie	A	„	J. Alexander	Caniambo
78	Cock Robin	A	„	W. Studman	Lucknow
60	Colonel Dale	A	„	T. F. Major	McMillans P.O.
222	Commodore Nut	A	Pony	Manifold and Co.	Purrumbete, Weerite
20	Commonweal	A	Draught	W. C. Holt	Foster
475	Congress	A	Pony	J. Reid	Warrion P.O.
477	Contractor	A	Light	J. T. Ovens	Cooma
476	Coronation Day	A	Pony	H. W. Atkinson	Gritjurk, *viâ* Coleraine
320	Count Rhymney	A	„	Bourke Bros.	Monomeith
193	Craig Eran	3	Draught	W. Walter	Tatura
391	Craigieburn Premier	A	„	P. Rentsch	Croxton East
224	Crest of the Wave	A	Thoroughbred	F. Hender	Franklinford
73	Crown Jewel	A	Draught	Kuhne Bros.	Rainbow
337	Culloden	A	Light	A. Millard	Yaapeet
468	Cymro Bach	A	Pony	H. S. Rudduck	Box 40, Exchange P.O., Collins-street, City
478	Cymro Bar	A	„	A. Dunn	Trawalla
210	Cyndett II.	A	„	G. J. Marshall	141 Stawell-street, Burnley
186	Dalmeny	A	Draught	A. J. Ritchie	Arawata
72	Dalmore	A	„	H. Wood	Bangerang

Stallion Register, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
479	Dalyston	A	Light	J. Kortright	Lara
262	Dan Again	A	Draught	C. J. Dunster	Willaura
339	Dancing Bell	A	Light	W. C. Marshall	Beremboke
480	Dandy	A	Pony	P. Purves	Green Hills, Rosebud
282	„ Jim	A	„	E. McDonald	Tangambalango
328	„ Nut	A	„	E. S. Small	San Remo
443	Dandy's Pride	A	„	G. Bennett	Albury, N.S.W.
69	Danedite	A	Draught	P. Gardiner	The Lake, Carlisle River
566	Darlings Comet	A	„	Brook Bros.	Moe
553	Decorator	A	Pony	F. E. Jennings	Inglewood
142	Delcampbell Cleve	6	Light	C. E. Baker	110 Tinning-street, West Brunswick
554	Detonator	A	Pony	Quinlan Bros.	Oaklands Junction
556	De Wet	A	Thoroughbred	R. Humphrey	Cudgewa
61	Dibdale	A	„	G. Officer	Woolsthorpe
441	Dick Alto	A	Light	A. Cheesley	Barnawartha
481	Digger	A	„	R. Dunbar	Harston, *viâ* Byrneside
505	Dillon Bell	A	„	S. J. Lewis	Parkers Plains, Baringhup
70	Dimboola	6	Thoroughbred	W. Rogers	Russell's Creek, Warrnambool
440	Direct Alto	6	Light	H. D. Morse	Bridgewater
333	„ Argot	5	„	F. Matchett	Bendigo
399	„ Wilkes	A	„	E. Scown	Terang
439	Director	A	Pony	J. Hurst	Kilmore
338	„	A	Light	H. T. Summis	Murphy's Creek, *viâ* Tarnagulla
134	Directway	A	„	R. Matchett	Bendigo
175	Don Alto	A	„	G. Maxwell	Green-street, Wangaratta
483	Donald	A	Pony	W. E. Attiwill	Boorkor, Hexham
150	Donald's Best	6	Draught	D. Kelly	Kunat
100	Dorregal Chief	A	„	P. R. Olson	Jeparit
62	Douglas Chief	6	„	W. J. Byrne	Beulah
557	Dreadnought	A	„	C. Le Lievre	Corack East
321	Druce	A	Light	J. Holt	Wycheproof
218	Drum Laddie	A	Draught	S. Brunt	Kyabram
265	Drumore	A	Thoroughbred	J. McPhee	“Inverness,” Merino
396	Drysdale	A	Draught	D. Crozier	South Morang
500	Dundonald	6	„	J. Adams	Swan Hill
494	Dunsby's Pride	A	„	J. R. Baldwin	Gre Gre Village
209	Earlmont	A	Light	A. J. Snow	Stanhope
98	Earl San	A	Thoroughbred	H. Maguire	Stratford
336	Eastern Star	A	Draught	L. G. McLean	Boolite
345	Echelon	A	Light	H. T. Nicholas	Thornton Lower
438	Emulator's Pride	A	„	W. McArthur	Ferndale, Noorat
484	Ettrickdale	A	Pony	F. Robinson	Huon
21	Excel	A	„	W. C. Holt	Foster

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age	Class.	Owner.	Address.
		Yrs.			
383	Eye Glass	A	Thoroughbred	W. B. Cumming	Mt. Fyans, Camperdown
384	Fairhaven	A	Draught	P. Smith	Lismore-road, Skipton
133	Fashion Direct	A	Light	R. W. Zirkler	Kerang
487	Fast Time	A	Pony	J. Nevett	Toolamba
176	Federal Prince	A	Draught	G. Luckie	Springhurst
555	Federation	A	Pony	A. Wilson	Cororooke
377	Finnimore	6	Thoroughbred	J. Brown	Natimuk
195	First Grattan	6	Light	J. I. Chisholm	Cranbourne-road, Dandenong
485	Fitzallen	A	Draught	S. P. Vaughan	Nyam, *viâ* Warracknabeal
24	Flash Jack	A	,,	P. McIntyre	South Cannum
151	Foreigner	A	Pony	C. Ferrari	Devondale
183	Fred	A	Draught	A. Dunning	Numurkah
208	Freedom	A	Light	J. Montgomery	Milawa
298	Futurist	A	Pony	E. Allan	Ondit
322	Gay Lad	A	Draught	J. Archibald	Sale
225	General Harvey	A	,,	Koschitzke Bros.	Bangerang
389	,, Keith	A	,,	J. Dunlop	Bridgewater
63	,, Scotch	A	,,	J. McIntyre	Minyip
141	Gentleman Jack	A	Light	R. Matchett	Bendigo
486	Gisborne	A	Draught	C. E. Umbers	Sea Lake
52	Glen Arthur	6	,,	C. T. Henderson	Weatherboard
281	Glenlea	A	,,	A. F. Smith	Nypo
244	Glenmarkie	A	,,	D. W. Drysdale	Yea
437	Glenmooney	A	Light	G. H. Palfrey	Campbellfield
558	Glenmore	A	,,	P. Murphy	Bindi P.O.
376	Glenspean	A	Thoroughbred	A. Cameron	Warracknabeal
436	Golden King	A	Light	H. Henry	Bowman's Forest East
488	Goldenwood	A	,,	J. T. Ovens	Cooma
64	Gossoon Bells	A	,,	W. Leach	Rheola
245	Gratton Bells	A	,,	T. Shearwood	Dooen North
152	,, Junior	A	,,	W. J. Parish	Horsham
25	Grey Marvin	A	,,	J. S. W. Uren	Krowera
346	Guy Fox	6	,,	H. Maddison	Mongan's Bridge, Dederang
207	Guy Todd	A	,,	W. Williams	St. Arnaud
196	Hafren Sensation	A	Pony	Miss B. Bruce-Reid	Bundoora
292	Halcyon	A	Light	J. M. Maclellan	241 Dandenong-road, Windsor
108	Hamboltonian Direct	A	,,	R. S. Wright	Yarrabert P.O.
319	Hames	A	,,	A. Dean	Tinamba
51	Hamiltonian	A	Draught	A. Steele	Woomelang
435	Handyman	A	Thoroughbred	G. Wells	Euroa
206	Happy Jack	A	Pony	J. B. Atchison	Southern Cross
559	Happy Vein	A	Thoroughbred	Fitzpatrick Bros.	Boort
347	Harmattan	A	,,	C. Tobin	Eskdale
132	Harry Almont	A	Light	S. Pemberton	Wedderburn
3	Harry Lauder	A	Draught	R. E. Keller	Lorquon
499	Havoc	A	Light	H. S. Bell	Minyip

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
434	Hayston	A	Thoroughbred	A. E. Barker	Kyabram
490	Heather King	A	Pony	R. Dunn	FairHills,Tahara
293	Hermes of Shetland Heights	A	,,	J. M. Maclellan	241 Dandenong - road, Windsor
187	Hero	A	,,	T. Park	North Wonthaggi
433	,,	A	Draught	J. Carruthers	Picola West
8	,, II.	A	Pony	Greaves Bros.	Budgeree, Yannathan
153	,, Laddie	A	Draught	H. F. Robinson	Kerang
205	Hiawatha of New Zealand	A	,,	H. E. Taylor	Pier Millan
561	High Commissioner	6	,,	S. Clark	Bundalaguah, Sale
190	High Honor	A	,,	C. H. Feldtmann	Major Plains
461	Highland Cleve	A	Light	M. L. V. Greatz	Irymple
246	Hillhead Knight	A	Draught	R. E. Krause	Boolite
348	Hivites	A	Thoroughbred	F. N. Heywood	Toongabbie
332	Hoprig	A	,,	R. F. Carmody	Everton
254	I am Here	A	Pony	A. T. Ingram	Orbost
491	Invincible	A	Draught	J. F. Ryan	Bearii R.O.
278	Ipidi	A	Thoroughbred	A. Kennedy	Arcadia
79	Ironsides	6	,,	M. Hore	Talgarno
432	Jack Style	A	Light	P. McEntee	Cudgee
431	James Osterley	A	,,	A. Huddleston	South Geelong
267	Jinghal King	A	Thoroughbred	J. Reid	Ararat
294	J.N.S.	A	Light	Wilson Bros.	Swan Hill
248	John Douglas	6	Draught	V. P. Dahlenburg	Winian East
139	Jolly Maltster	A	Thoroughbred	Defence Department	Melbourne
26	Karamu-Glenmarkie	A	Draught	J. J. Owens	Gannawarra
268	Kelmscott II.	6	,,	A. W. Lackman	Care of Agricultural Society, Murrayville
560	Kelms Pride	A	,,	J. Dugdale	Myrniong
28	Khamasin	6	Light (Arab)	S. Winter-Cook	Hamilton
204	Kilburnie	A	Draught	A. E. Whitfield	Marong
280	King Albert	A	,,	G. Francis	Horsham
279	,, Ballana	A	,,	J. H. Kennett	Kaniva
50	,, Clyde	A	,,	A. G. Buchanan	Seymour-street, Terang
323	,, Duncan	A	,,	P. Leydon	Cooma P.O., Terang
249	,, Jimmy	A	Draught	J. Henderson	Leongatha
430	,, Jimmy II.	A	Pony	R. N. Larcombe	Mt. Moriac
465	,, of Clubs	A	Draught	J. Beard	Terang
49	,, of the Kings	A	,,	C. N. Hokin	Tylden
507	,, of the Roses II.	A	,,	M. McGillivray	Bald Rock
344	,, of the Shepherds	A	,,	E. R. Campbell	Nypo
260	Kingling	A	Thoroughbred	M. Widdicombe	Gymbowen
489	Kinlock	A	Draught	W. Hicks	Miram
27	Knight Royal	A	,,	A. C. Gready	Carron, *via* Sheep Hills
549	Laird Again	A	,,	P. Davey	Miner's Rest
154	Laird o' Gowrie	A	,,	T. Smith	Rushworth

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age. Yrs.	Class.	Owner.	Address.
429	Lanark's Pride	A	Draught	J. Hill	Yanac
266	Lancashire Lad	6	„	W. Robinson	Armstrong
467	Latest Fashion	A	„	F. W. Benson	Tarwin Lower
29	„ Style	A	Light	T. Buckley	Romsey
155	Le Rosier	A	„	Emily Parith	Horsham
48	Lee Creek Squire	A	Draught	A. K. Lange	Armytage
109	Leevialand	A	Light	A. Bickley	Trafalgar
428	Leo	A	Pony	S. Mirams	South Warragul
349	Lieutenant J.	A	Light	G. Smith	Pirron Yallock
324	Light o' Frisco	A	„	J. H. Lucas	Macarthur
99	Linkwood	A	Draught	W. J. Jenkin	Willaura
14	Lion Prince	A	„	J. F. Hurley	Bobinawarrah
427	Little Bill	A	Light	A. T. Corner	Fosterville P.O.
131	„ Billy	A	Pony	C. Pratt	Watchupga
156	„ Comet	A	„	T. McNally	Seymour
226	„ Eumarrah	A	„	R. Painter	Leaghur
463	„ Jim	A	„	D. Scott	Maldon
492	„ Lonsdale	A	„	J. Neeson	Chetwynd
426	„ Mickey	A	„	C. Simon	Leongatha
203	„ Milton	A	Draught	J. Hives	Tempy P.O.
576	„ Wonder	A	Pony	G. C. Roughead	Ruby
130	Lock Albyn	A	Draught	N. O'Keefe	Pine Lodge Railway Station
562	Lord Aldie	A	„	S. E. Mackieson	Buchan
350	„ Armadale	A	„	H. Thomson	Newlyn
227	„ Bingen	A	Light	E. J. Janetzki	Jeparit
577	„ Dalmuir	A	Draught	E. W. Harders	Dimboola
493	„ Dundee	A	„	T. Hayes	Hardies Hill
97	„ Everest	A	„	G. R. Ladson	Mincha West
351	„ Glengyle	A	„	W. Linehan	Wunghnu
202	„ Jellicoe	A	„	McMahon Bros.	Galah
496	„ Northcote	A	„	Wm. Hicks	Pleasant Hills, Miram
325	„ Plunton	A	„	M. J. and J. J. Runceman	The Pines, Mallan, N.S.W.
448	„ Ronald	A	„	W. Sharrock	Vite Vite
47	„ Wallace	A	„	C. E. Cartledge	Kilmany
177	„ Welkin	A	Thoroughbred	W. and H. Carmichael	Swan Hill
530	Lost Time	A	„	A. Martin	Maffra
497	Loudoun Squire	A	Light Hack	J. Dunlop	Birregurra
1	Loyalist	A	Draught	O. Gray	Wedderburn
129	Lu Lus Dandy	A	Pony	Sir Rupert T. H. Clarke	Lancefield Junction
316	Lucky Jim	A	Draught	J. Morris	Woolsthorpe
531	Lue Ribbons	A	Light	L. Williams	Ross Creek
326	Lymm Forest Boy	A	Draught	M. Attwood	Roseberg
128	Lymm Truffle 2nd	6	„	J. C. Wallis	Miram
277	Lyndale	A	„	H. Conn	Barrakee
425	Lyndhurst	6	„	D. J. McKenzie	Warracknabeal
144	Lyntourie	6	Thoroughbred	L. R. Clarke	Newstead
140	McGregor's Fancy	A	Draught	R. J. Wilson	Krowera, *viâ* Loch
271	Macedon Hero	6	„	P. Williams	Riddell's Creek
46	Magician	A	„	T. Adkins	Korumburra

STALLION REGISTER, 1923–24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
297	Magician J of Shetland Heights	2	Pony (Shetland)	Mrs. J. Maclellan	241 Dandenong-road, Windsor
526	Mainstitch	A	Thoroughbred	F. C. Mackay	Violet Town
545	Major Dale	A.	Draught	J. Forster	Boort
4	Major Douglas	3	"	V. Dahlenberg	Winnia East, *viâ* Nhill
94	Major Lawrence	A	"	M. Parnell	Katamatite.
252	Major Ribbonwood	6	Light	F. W. Grabsch	Horsham
532	Maldon	A	Pony	J. E. Sage	Somerville
498	Maltstead	6	Light	E. J. Wright	Flynn's Creek
375	Maori Chief	A	"	J. Caldow	Winchelsea
501	Maori Jack	A	Draught	A. Potter	Naroghid
6	Marcus	A	Light	W. E. J. Craig	8–22 Elizabeth-street, Melbourne
394	Maringa	6	"	E. Collins	Dunkeld
125	Markhope	A	Thoroughbred	Trustees, Sir Rupert Clarke	Lancefield Junction
533	Marshall Clyde	A	Draught	J. Nunn	Birchip
374	Master Brigham	A	Pony	S. Waters	Carboor
571	Master McKinney	A	Light	J. W. Keirce	Buckrabanyule
578	Master Valve	A	Pony	A. Lang	Winter's Flat, Castlemaine
565	Master Wattee	A	Draught	Brock Bros.	Moe
568	Mauritius	A	Light	J. B. Zander	King-street, Melbourne
361	Medbourne Prince	A	Draught	F. Shaw	St. Arnaud
68	Merry Oliver	A	Thoroughbred	E. R. de Little	Sth. Caramut
373	Message	A	Light	A. J. Tack	Kongwak
201	Michael	A	Pony	Mrs. Bell	Blackwood Flynn
372	Middlemarch	A	Draught	M. J. Egan	Charlton
579	Model's Fancy	A	"	W. D. Hopper	Terrick Sth.
424	Moeser	6	"	J. Tallent	Craigieburn
80	Moira Lad	A	"	C. R. Cunnington	Bamawm Extn.
534	Monk	A	Pony	R. Angus	Springvale
185	Montrae Bold	6	Draught	E. Don	Newham
315	Monty	A	Pony	G. J. Morris	Woolsthorpe
371	Moolap	A	Light	T. Mitchell	Durham Lead
157	Morocco Lad	A	Draught	Mrs. E. Parish	Horsham
87	Moving Picture	A	Thoroughbred	Executors, T. Maidment	Moyston
506	Napoleon	A	Draught	S. J. Lewis	Parker's Plains, Baringhup
7	Narahquong	A	Thoroughbred	H. Garner	Yan Yean
423	Never Forget	A	Pony	F. Ballard	Picola
422	Newfield's Baron	A	Draught	Coe Bros.	Coleraine
30	Newton Banks	A	"	O. Shaw	Wooriwyrite, *viâ* Terang
178	Newton Mains	A	"	J. A. G. Wilson	Kenilworth T.P.O., *viâ* Moyne
71	Newton Stewart	A	"	A. H. Borgelt	Tarranginnie Rly. Stn.
261	Newton Style	A	"	Currell Bros.	Cobden
124	Newton's Best	A	"	C. A. Graham	Rupanyup
228	Newton's Sensation	A	"	R. Banko	Simmies, Koyuga

STALLION REGISTER, 1923–24—*continued.*

Cert. No.	Name.	Age	Class.	Owner.	Address
		Yrs.			
11	Nigger Minstrel	6	Thoroughbred	D. W. Heaney	Benalla
215	Nimrod	A	Pony	Geo. Small, junr.	Birchip P.B.
123	Norval Junior	A	Light	J. English	Bulart, *viâ* Cavendish
580	Oakburn	A	Draught	A. J. Pratt	Wedderburn
581	Oakland's Pride	A	„	C. F. Dolan	Box 27, Ouyen
179	Oakwood Direct	A	Light	A. McCracken	Barney's Reef
90	October	A	Thoroughbred	H. F. and F. Hoysted	Gray-street, Wangaratta
444	Onward	A	Draught	H. T. Wilson	Wodonga
359	Onward O	A	„	E. Coward	Congupna Rd. R.S.
421	Orewar	A	Thoroughbred	T. J. Pratt	Colac
314	Ormond Dale	6	Draught	Letcher Bros.	Donald
110	Osprey Junior	A	Light	J. Axford	Terang
510	Our Guide	A	„	Geary Bros.	Tungamah
420	O.Y.K.	A	„	G. H. Palfrey	317 Little Collins-street, City
419	Patchwork	A	„	H. Milte	Lascelles
122	Patrician	A	Draught	W. Gibbons	Galah
418	Patrician Pride	6	„	P. Egan	Bealiba
121	Patriot	A	„	A. G. Mibus	Croxton East
313	Pearlyn	A	Light	F. W. Bowden	Won Wron
547	Peterhof	A	Thoroughbred	W. T. Rowe	Wallenduc
31	Petrillot	A	„	R. Barr Smith	Mt. William, Willaura
446	Piper	A	Pony	J. Ford	Wickliffe
264	Pirateer	A	Light	D. McArthur	Victoria Valley
573	Poilu	A	Pony	D. L. Goodwin	Kaniva
318	Polo King	A	„	B. W. Canole	Dartmoor
511	Pompy	A	„	E. H. B. Cleland	Newhaven
358	Preble	6	„	A. F. McKenzie	Hexham
67	Predominate	A	Light	E. R. de Little	Sth Caramut
45	Premier Again	6	Draught	D. C. Greig	c/o Adamson, Strettle and Co., Melbourne
417	Premier Jack	A	„	V. Vaughan	Condah
276	Premier Montgomery of Willow Bank	A	„	E. Doherty	Congupna
512	Premier Ward	A	„	J. S. and R. Jobling	Mumbel Plains
582	Pretty Bobby	A	Pony	Jas. Orr	210 Victoria-street, Ballarat East
86	Pride of Clutha	A	Draught	J. H. Cornfoot	Winchelsea
513	Pride of Lochiel	A	„	J. T. Ovens	Cooma
583	Pride of the Ponds	A	„	E. Drayton	Waurn Ponds
470	Pride of the South	A	„	H. G. Hill	Nurrabel
584	Prince Bally	A	Pony	H. C. Bird	Yarram
382	Prince Bellinda	A	Light	O. Lock	Thorpdale
180	Prince Bells	A	„	R. Youren	Natte Yallock
158	Prince Benmore	A	Draught	W. D. Starbuck	Rupanyup
120	Prince Coupar	A	„	L. Clarke	Newstead

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address
		Yrs.			
416	Prince Douglas	A	Light	P. Martin	Molesworth
392	,, Harrod	5	Pony	Miss B. B. Reid	Bundoora
159	,, Harold	A	Light	C. E. Darley	Hopetoun
229	,, Lyall	A	Pony	G. L. Buchanan	Horsham
119	,, Maurice	A	Light	W. P. McNaughton	Walpeup
415	,, of Nullan	A	Draught	R. V. Quick	Brim
585	,, Que	A	Pony	A. E. Callow	520 Mair-street, Ballarat
586	,, Rhymney	A	,,	E. Kennedy	Bass
515	,, Ribbon	A	Light	W. A. Riedell	Tongala
514	Punch	A	Draught	E. H. B. Cleeland	Cowes, Phillip Island
587	Quality	6	Pony	A. E. Callow	520 Main-street, Ballarat
414	Quamby	A	,,	P. McEntee	Cudgee
251	Quatta's Baron Belmontian	6	Draught	R. F. Carmody	Everton
413	Quattas Belmont	A	,,	M. Lindsay	Baranduda
230	Radium	A	Light	Manifold and Co.	Purrumbete, Weerite
312	Reality Rex	A	Pony	J. Archibald	Sale
311	Red Lion	6	,,	G. H. Whitehead	Minhamite
588	Red Wilkes	A	Light	E. Rasp	5 Eyre-street, Ballarat
296	Referee	A	Draught	E. Allan	Ondit
96	Relight	A	Light	D. Cameron	Newham
370	Report	A	,,	S. Fraser and Sons	440 Little Collins-street, City
529	Rhymney II.	A	Pony	Mrs. G. Roberts	Goroke
412	Ribbon Bells	A	Pacing	Beattie Bros.	Tungamah
411	Ribbon Wheel	A	Light	V. Vaughan	Condah
275	Richard III.	A	Pony	A. Ruttle	Inverloch
535	Rimfire	A	,,	Lucas Bros.	Carlisle River
516	Robin Roy	A	Light	C. Paulin	89 Bay-street, Port Melbourne
466	Rocket	A	Pony	A. W. Thomson	Hamilton
570	Roseworthy	A	Light	A. Stewart	c/o Adamson, Strettle and Co., Melbourne
253	Royal Albert	A	Draught	R. J. Evans	Bushfield
93	,, Ben	A	,,	J. H. Hamilton	Inverleigh
469	,, Bute	A	,,	G. Luckie	Springhurst
589	,, Churchill	A	,,	A. Kennedy	Tatura
189	,, Comedy	6	Thoroughbred	A. Sutherland	Welshpool
410	,, Dandy	A	Pony	C. Waiting	Cohuna
575	,, Derby	5	Light	G. H. Eastaugh	743 Burwood-road, Auburn
32	,, Duke	A	Draught	Executors late C. W. Dennert	Hamilton
160	,, Flush	A	,,	M. Colton	Terang
357	,, Garvin	A	,,	G. F. Brown	Winchelsea
517	,, Hero	A	,,	G. Giddings	Sea Lake

Stallion Register, 1923-24—*continued.*

Cert. No.	Name.	Age	Class.	Owner.	Address.
		Yrs			
88	Royal Mac	A	Light	Charity Bros.	Serpentine
518	,, Mint	A	,,	L. A. Harper	Rutherglen
388	,, Prince	A		G. G. Goudie	Ultima
85	,, Robin	A	Draught	J. Boyle	Verdant Vale, North Boort
409	,, Salute	5	,,	G. Brown	Bennison
237	,, Saxon	A	,,	J. M. Hunter	9 Hilda-crescent, Hawthorn
408	,, Shepherd	A	,,	J. McBean	Miga Lake
591	,, Standard	A	,,	K. Cameron	Warracknabeal
387	,, Success	A	,,	W. Elsom	Dart Dart
592	,, Whips	A	Light	A. J. Walter	Warragamba
593	,, Willie	A	Draught	K. Cameron	Warracknabeal
302	Royalty	A	Pony	W. Coe	Coleraine
255	R. W. Estoll	A	Light	A. E. Lobb	Lamplough
166	St. Aidan	A	,,	M. Cribbes	Faraday
106	St. Simon	A	Draught	G. J. Butler	Carisbrook
84	Safe Voyage	A	Light	V. Meyers	Lakwood
471	Sam Huon	A	,,	J. P. O'Brien	110 Powlett-street, East Melbourne
161	Satellite Junior	A	Pony	Saunder Bros.	Youarang
44	Satellite's Pride	A	Light	R. Berry	Navarre
231	Saturn	A	Pony	A. J. Plum	Docker's Plains
197	Scotch Thistle	5	Draught	J. R. Stokes	Care of Adamson, Strettle and Co., City
15	Scotland Yet	A	,,	E. A. Riether	Balliang
191	Scotland's Bloom	A	,,	W. G. Parish	Horsham
162	,, Fancy	A	,,	Alexander Bros.	Carlisle River
307	Scottish Lad	A	,,	D. L. Bodey	Jung
536	,, Peer	A	,,	Tyrrell Downs Agricultural and Pastoral Company Limited	Tyrrell Downs, Sea Lake
528	Scotty	A	,,	H. Roulston	Muskerry E.
574	Sea King	A	,,	A. McCready	Colac
238	Seldom	A	Light	R. N. Keating	Antwerp
143	Senator	A	Draught	J. R. Stokes	3 Bloomberg-street, Abbotsford
380	Shandon Bells	A	Light	T. Long	Nhill
274	Shanter's Ghost	A	Pony	P. E. Cutche	Clear Lake
111	,, Pride	6	Draught	G. A. Thompson	Kyneton
335	Sheriff Huon	A	Light	V. Thomas	6 Hope-street, Richmond
407	Shepherd	A	Draught	Warren Bros.	Stawell
163	,, Plaid	A	,,	Emily Parish	Horsham
164	Shepherd's Boy	A	,,	I. Kelly	Korong Vale
594	Shifty Dick	A	Light	J. T. Neeson	Nareen
406	Siam	A	,,	H. Murphy	Nanneella
509	Silver Cup	A	Draught	A. S. McLeod	Box 80, Kyabram P.O.
16	,, King	A	Light	E. D. Scown	Terang
310	Silverlight	A	Pony	R. J. Jarvis	Cudgewa

STALLION REGISTER, 1923–24—*continued.*

Cert. No.	Name	Age.	Class.	Owner.	Address.
		Yrs.			
165	Silverton	A	Pony	J. Rogers	Allansford
595	Sir Burnhead	A	Draught	Boyd Bros.	Tarrone, Koroit
369	„ Carlaw	A	Light	V. J. Byrne	Black Heath
33	„ Clyde	A	Draught	S. J. Taylor	Lake Boga
256	„ Don Pedro	A	„	J. McKee	Clarendon P.O.
34	„ Douglas Haig	A	„	Mrs. J. Biddlecombe	Gold Hill, Shelford
309	„ Everest	6	„	A. Ralston	Lucknow
405	„ Fabric	6	„	Allitt Bros.	Diapur
596	„ Goulding	A	Pony	L. T. Rash	5 Eyre-street, Ballarat
597	„ Hambletonian	A	Light	J. H. Uren	Maxwell-street, Kerang
404	„ Hector	A	Draught	F. Wallbridge	Somerton
502	„ Lowlander	A	„	F. H. Jolly	Gerang Gerung
460	„ Mac	A	„	Wm. Blake	Rushworth
288	„ Regulus	A	„	J. B. Howe	Memtie, Bridgewater
308	„ Roderick	A	„	W. Byrne	Trentham
537	„ Wilfred	A	„	A. J. Mackay	Cooncoer Bridge
113	Skipper	A	Pony	G. Hicks	Strathallan
273	Skobeloff	A	Thoroughbred	A. Thomson	Gnarpeit, Lismore
362	Solomon IV.	A	Draught	C. H. Perkins	Rainbow
356	Some Style	A	Light	T. F. Armstrong	Campbell's Creek, *viâ* Castlemaine
220	Southern Lad	6	Draught	G. McKenzie	Pullut
598	Splendour	A	Light	J. McKenna	Hartwould, Picola
368	Springbank Lawrence	A	Draught	W. H. Crawford	Hamilton
538	Springwood	A	Light	G. J. Vagg	Cobden
43	Squib	A	Pony	A. Robertson	care of A. W. Hobbs, Koria, *viâ* Willaura
92	Stanley May	A	Draught	G. R. Ladson	Mincha West
77	Starlight	A	„	J. Fuller	Mitre
462	Stern Anchor	A	Thoroughbred	A. Noble	Bleak House, Birregurra
247	Stirling Castle	A	Draught	Vere McHenry	Cowes, Phillip Island
367	„ Prince	A	„	R. H. Cumming	Bael Bael, *viâ* Lake Charm
232	Stockman's Lad	A	„	D. C. Gilsenan	Bung Bong
42	Straightaway	A	Light	T. Allen	Narrewillock, *viâ* Glenloth
91	Style O	A	„	Wm. Barry	Heathcote
519	Sudbourn's Victory	A	Draught	A. C. Head	Seymour
329	Sunbeam	A	Pony	W. Daniel	Nagambie
95	Sunbury	A	Light	T. C. Nolan	Carinya, Tarrawingee
181	Sun Star	6	Pony	J. T. Unwin	Spring Vale
272	Sweet Abbey	A	Light	N. Chamberlain	Morwell
599	Take Bells	A	„	J. Ferguson	Redesdale
118	Tam O' Shanter Bill	A	Pony	P. Gordon	Ellerslie

Stallion Register, 1923-24—*continued*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
192	Tamie O'Groat	5	Draught	J. McGregor	Ballarat East
306	Tatahu	A	Light	M. Stephenson	29 King-street, Fitzroy
41	Tax Payer	A	Pony	G. King	Scott's Creek
600	The Abbot	A	Light	A. B. Hamilton	Riccarton, Fish Creek
366	,, Crown	A	Draught	T. G. Martin	Kenmare
5	,, Factor	A	,,	C. Bates	Dobie
35	,, Hague	A	Thoroughbred	S. Winter-Cooke	Hamilton
563	,, Link	6	Draught	Taylor, H. E.	Nullawil
182	,, Masher	4	Pony	W. N. MacNicol	Nangella, Casterton
393	,, Premier	A	Draught	Geo. Taylor	Leichardt
269	,, Standard	A	,,	G. N. Morrish	Ouyen
117	,, Starling	A	Light	S. Farrell	Stratford
539	,, Vanquisher	A	Thoroughbred	G. W. Horne	Yendon
445	,, Warrior	A	Pony	H. Wilson	Wodonga
365	,, Yarra Chief	A	,,	J. Douthie	Woori Yallock
355	Thoughtful	A	,,	P. McIntosh	Ondit
354	Tim Brigham	A	,,	J. C. Nicoll	Binney-street, Euroa
403	Toby	A	,,	A. W. Thompson	Monivae station, Hamilton
364	Togo	A	Draught	H. Currie	Waterloo P.B., Joel Joel
304	Togo's Chief	A	,,	J. Hefferman	Konongwootong, Coleraine
520	Tony	A	Pony	D. J. Kennedy	Pine-grove, Cobram
330	Toy Bells	A	Light	W. H. Horn	Police Station, Ararat
83	Tracey Alto	A	,,	E. Rash	Box 67, G.P.O., Ballarat
379	Trafalgar	A	Thoroughbred	Executors of W. E. Mitchell	Corryong
217	Tramore	A	,,	McDonald Bros.	Mortlake
402	Trelawney Timo	A	Draught	R. H. Larcombe	Clifford East, Mt. Moriac
395	Trotting Railway II.	A	Pony	Executors of late Captain Staughton	Eynesbury Estate, Milton South
116	True Steel	A	,,	A. Young	Rathscar
401	Trump	A	,,	A. W. Thompson	Hamilton
66	Truro	A	Light	J. E. Light	Quantong
188	T.T.	A	Thoroughbred	C. Thompson	Mildura
167	Udale	A	Draught	J. Holdsworth	Jung Jung
13	Valmond	A	Light	E. W. Hamilton	Piambie
233	Varco	A	Thoroughbred	W. McMeeken	Kerang
200	Venerror	A	Light	J. C. Wallis (senr.)	Miram
257	Viking	A	,,	A. G. Turnbull	Winton, Horsham
291	Viking of Methven	A	Pony	Mrs. McLellan	Dandenong-road, Windsor
386	Vin Direct	5	Light	J. D. Mulfahey	South Melbourne
540	Von Atom II.	A	Pony	J. A. Padgett	Berry Bank

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
521	Waironga Prince	A	Draught	G. W. Fielding	Watchem
363	Wakepan	A	Light	A. W. Johnston	Clear Creek, Eldorado P.O.
168	Warrigal	A	Pony	S. S. Baulch	Orford
522	Wee Jim	A	,,	J. R. Kettyle	Castlemaine
169	Welcome Bells	A	Light	T. J. Splatt	Weering
541	Welsh Flyer	A	Pony	F. Irving	Tyrrell Downs
341	Welsh Flyer	A	Light	P. J. Reid	Milawa
115	What Oh	A	Pony	R. J. Hill	Dandenong
38	Widgiewa Sapper	6	Draught	F. J. J. Schultz	Cowangie
542	Wigton Again	A	,,	Con Murphy	Oxley
234	William of Orange	A	Thoroughbred	A. J. Gray	3 Fletcher-street, Essendon
353	Wiltshire	A	Light	C. Wood	Minyip
400	Windlesham	A	Thoroughbred	W. T. Hillman	Queen-street, Bendigo
301	Winteriga	A	,,	W. Coe	Coleraine
258	Wonder	A	Pony	Wm. McEvoy	Alexandra
170	Wonga	A	Light	Emily Parish	Horsham
18	Woodland's Beauty	6	Pony	E. Fulton	Horsham
89	Woodland's Dandy	A	,,	G. Aldous	Banyena
17	W. W. Estell	A	Light	J. Hannah	Donald
303	Yeneda	A	Thoroughbred	D. A. Hutchison	Yan Yean
360	Young Badaween	A	Pony	F. Shaw	St. Arnaud
259	Young Brigham	A	,,	W. J. Craig	Cobden
171	Young Brigham	A	,,	A. S. and L. G. Mills	Natte Yallock, *viâ* Avoca
40	Young Clarionet	A	Light	John Mitchell	Piavella P.O., *viâ* Prairie
39	Young Comet	A	Pony	T. Adkin	Greyacres, Korumburra
523	Young Coronation	A	Draught	G. Pitt	Jeparit
36	Young Coronation	A	,,	W. J. Bennett	Cannie Railway Station
548	Young Dundonald	A	,,	W. H. Bell	Bowser
74	Young General	A	Pony	W. Maddill	Tongala
235	Young Ginger	A	,,	Manifold and Co.	Purrumbete, Weerite
236	Young Hero	A	,,	F. W. Hender	Franklinford
524	Young Hero	A	Draught	Jas. Branson	Lake Cooper
305	Young Linkwood	A	,,	J. H. Peverill	Charlton
270	Young Lord Lyon	A	,,	H. Chamberlain	Morwell
398	Young Lowrie	A	Pony	K. McPherson	Broadford
216	Young McLeish	A	Draught	Jas. Charlton	Stony Creek
300	Young Nailstone	A	,,	J. J. Nulty	Walpeup
114	Young Repeater	A	,,	R. N. Johns	Danyo
352	Young Royal Oak	A	,,	H. Walker	Merbein
525	Young Shepherd	6	,,	G. Chapman	Minyip
482	Young St. Albans	A	,,	J. McCormack	Roseberry East

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose. friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux or lime sulphur spraying for the black spot of apples and pears, for scab and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a weak lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead. Even a dry dusting with lime or with ordinary soil will keep the slugs in check.

Codling moth spraying, too, will be in evidence this month. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

Arsenate of lead may be mixed with nicotine sprays, or with Bordeaux mixture, without any detriment to either spray, if necessary.

The Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

REMINDERS FOR NOVEMBER.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Journal of Agriculture*, November, 1923, page 659. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will. Provide salt-lick consisting of 20 lbs. bone meal or rock phosphate, 20 lbs. salt, and ½ lb. sulphate of iron.

Pigs.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate per 100 lbs. live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

BEE-KEEPING.

In most districts, October is the principal swarming month; in late localities, particularly at the higher elevations, most of the swarming takes place in November. Where a honey flow is expected from Redgum or Yellow Box during December and January, it is not wise to make a further increase in the number of colonies by allowing after-swarms to come off and hiving separately, as the parent stock would be too much depleted of bees, and there would not be sufficient time for it to recover, or for the swarms to build up, before the honey flow is on, and much of it would therefore be lost.

After-swarms can best be prevented by hiving the first or prime swarm on the old stand and moving the colony from which it came to a new stand, at the same time destroying all the queen cells in it except one—the most perfect and forward one.

If no increase at all is desired, the parent colony may be left alongside the old stand on which the swarm was hived, but with the entrance facing in a different direction. When the young queen in the swarmed stock is laying, which will be in about three weeks, the hive may be gradually turned round till it faces the same way as the swarm, and, after removing the old queen from the swarm, the two stocks may be re-united, thus making a very strong colony with a young laying queen, in the best condition for storing honey and very unlikely to swarm again the same season.

The uniting of the two stocks is best done towards evening, by first giving both a little smoke between the combs and then alternating them for the time being, so that each comb from the swarm is between two of the old combs, the object being to thoroughly mix the bees. Two or three days after, the combs can be sorted; the best should be selected for the brood chamber and the others put in the upper story. Uniting should not be attempted till after the young queen is laying, otherwise there will be much fighting.

In localities where the colonies have come through the Winter very strong, there is likely to be much swarming wherever Cape Weed or some other pollen-yielding plant is plentiful, the duration of blooming and of swarming depending, of course, upon the weather.

When several days of bad weather follow the hiving of swarms, it may be advisable to feed sugar syrup (one part sugar to one part water) to keep up comb-building and brood-rearing, so as to have the greatest number possible of field bees in the hive during the honey flow later on. Honey should never be used for feeding bees, unless it comes from an apiary which has been absolutely free from disease for at least two years.

VITICULTURE.

Vineyard.—Field grafts require careful attention in the way of removal of suckers and scion roots. (See Bulletin on "Spring Grafting," No. 38, page 29.) Keep a sharp look out for Black Spot and Downy Mildew; whether the latter disease is seen or not, finish spraying by 20th October. A preliminary spray when the bunches are most visible is strongly recommended. In irrigated vineyards make it a rule to *spray immediately before watering.* Information on Black Spot and Mildew will be posted on application. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping and topping. Avoid excessive topping; summer pruning is often more injurious than useful in warm, dry climates. Young vines especially need judicious handling. Disbudding, though not indispensable, is of great use to shape the vine. Early execution is imperative. *Better not disbud at all than disbud late.* Cincture Zante currant vines after flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Taste all young wines; beware of dangerous symptoms in unfortified fruity wines, which may need treatment. Fill up regularly all unfortified wines

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PASSION FRUIT CULTURE IN VICTORIA.

(Continued from page 611.)

By J. Farrell, Orchard Supervisor.

XVII.—Yield Per Acre, Marketing Fresh Fruit, Prices, Uses, Processing, and Prospects of the Industry.

Passions usually come into full bearing at from five or six years old, but the subsequent annual yield of fruit varies considerably, according to the nature of the cultural, manurial, and other treatment bestowed on the vines during the period of development. In adopting the 18-ft. x 12-ft. system of planting, provision is made for, approximately, 200 vines per acre, and, when cared for in a reasonable way, a case of fruit to the vine, or 200 cases per acre per annum, may be regarded as a fair average crop. Conditions of growth also largely influence the size and quality of the fruits.

In cultivating the common Black Passion, the main objective should be the production of the largest fruits possible for the variety. Uniformity in size is also desirable, and the fruit should be graded prior to being marketed. Large fruits of uniform size with dark, smooth skins, command the highest price, whereas, the mixing of large and small fruits in a case affects, in the inverse ratio, the commercial value of the better specimens. For instance, a case of well-graded small fruit is of higher value than one in which occasional large fruits appear. Measured longitudinally, the larger, well-proportioned, common black fruits may reach an average of 2¼ inches; whereas a similar measurement of the smaller, inferior types would, probably, not average more than 1½ inches. This recognised discrepancy in its size and quality makes, when the higher prices obtainable are desired, the grading of fresh fruit for market obligatory.

The fruit should not be allowed to remain on the vines after it has reached the ripe stage, for it soon begins to wilt and deteriorate in commercial value. It should, therefore, be picked and placed on the market with as little delay as possible. The skins of ripe fruit are dark-purple, smooth, and glossy, the perfect specimens being well filled with pulp and seeds. As previously stated, the sacks of pulp, each containing one seed, are borne on short stout fibres attached to and projecting from the inside of the fruit capsule. In dry warm weather particularly, the fruit capsule quickly loses its natural moisture, and the pulp-sack, because of its connexion with the shell, also soon parts with its liquid. This creates a vacuum which is indicated by indentations appearing in the outer surface of the fruit, commonly termed "wilting." Although the pulp of slightly crinkled fruit is the more palatable as a dessert, it is obvious, nevertheless, that passions should be marketed as soon as possible after ripening.

Nature provides fruits of normal development with 150 pulp-vessels and seeds, but sometimes all do not ripen, though as many as 158 seeds have been found in abnormal specimens, while the average number in sub-normal fruits may not exceed 140. However, the cash value of a fruit cannot be based solely on the number of pulp-vessels and seeds, but rather on the actual quantity of pulp it contains, and as a rule the best filled fruits are those of normal development containing the highest number of seeds for their class.

Passion fruit is usually sold unwrapped in the ordinary two-division bushel case, which contains about 35 dozen fresh fruits of medium size, weighing about 34 lbs. Prices vary considerably during the fruit season; early fruits, about the beginning of March, bring from 20s. to 25s. per case; later, when the supply is more plentiful, from 8s. to 12s.; then, near the end of the late crop, from 23s to 30s.; while small lots later sometimes command 40s. It is somewhat difficult to strike an average; but, for the last few years, this would probably be in the vicinity of 15s. per case for the fruit season.

The ever increasing popularity of this deliciously flavoured fruit for use as a dessert, its suitability for jam making, flavouring fruit salads, for icings, making cakes, &c., has insured it a permanent place in the fruit markets of the Commonwealth. Notwithstanding the increasing local demand for the passion, the relatively extensive areas being brought under its cultivation will necessitate the finding of markets for a sure, future exportable surplus. The best and most economic method of exporting passion fruit is in the form of pulp, which, because of its unique virtues, has fortunately already made an extremely favorable impression on its users in England, America, and other countries.

The processing or pulping of passions consists of cutting the fruits in halves, and removing the pulp from the capsules by the aid of peach-pitting, or ordinary spoons. The pulp is then placed in lacquered tins or glass jars, the latter being mostly used for the purpose. A little syrup is added; then the mixture is sterilized by heating same to a temperature of from 180 deg. to 190 deg. Fahr. for from fifteen to twenty minutes, as a further factor in preserving it. Or the pure pulp may be placed in containers, such as are used for bottled fruits, and sterilized in the ordinary way.

Relatively large quantities of passions are treated by manufacturers during the fruit season, and they find that a bushel case contains from 30 dozen to 36 dozen fruits, according to size, and that the quantity of pulp obtained from a case is from 10 lbs. to 14 lbs. This, they say, is worth anything between 1s. 6d. and 3s. per lb., according to the method of processing, style of container, and general get-up; and that from 10s. to 11s. per case is the outside price that manufacturers can give for passion fruit for this purpose. The Mammoth is less suitable for pulping than the Common Black variety; and, although there is a limited market for Banana passions (*Tacsonia*) for dessert purposes, &c., these are of little value for processing.

There is a feeling in England and America that the numerous black seeds which characterize this fruit should be removed at the pulping; but Australians acquainted with same who see samples of this seedless pulp abroad, usually assume that it is not the "real article."

There is an ever-increasing demand for passion pulp, as well as for the fresh fruit, and recently a large catering firm in London sent an order to Australia for 1,000 cases of bottled pulp. Assuming that the demand for this article during the next five years increases at the same ratio as happened in the last five, and if care be taken in the cultivation of the vines and in marketing the fruit, the prospects of the industry would seem to be assured.

PLANTS OF VICTORIA.

A volume containing a census of the plants of Victoria with their regional distribution and their vernacular names has been published by the Field Naturalists' Club. This work had its beginning in the year 1907, when a committee was appointed to fix popular names for the better known native plants. Later it was decided to make the purpose a more ambitious one, and to include all the known plants of the Victorian flora; this meant that some 2,000 species, few of which possessed suitable vernacular names, had to be dealt with. Lists of plants to which names were given provisionally were drawn up and distributed, and were afterwards revised in the light of criticisms given them, and where necessary, the scientific names were altered to meet the requirements of the international rules of botanical nomenclature.

The book, which will be of great use to every one desiring a better acquaintance with our native plants, is obtainable from the Field Naturalists' Club, Royal Society's Hall, Victoria-street, Melbourne. **Its price is 3s. 6d.**

DAIRY TYPE AND ITS VALUE.

By J. S. McFadzean, Senior Dairy Supervisor.

THE TYPICAL COW.

It would be well if every one proposing to take up dairy farming as a business would make it the initial step, prior to establishing a herd, to become as fully conversant as possible with the subject of dairy type. In the eye of the expert stock-breeder, the typical well-bred dairy cow is a perfect combination of bovine elegance and utility. Her conformation is such that, when walking, her action is a graceful movement; her head is held with alert poise, indicative of full vitality: the body carried with just that freedom of action which precludes any suggestion of awkwardness; the legs and feet move straight forward, taking each step clear of the ground and clear of each other; and the whole action of the animal expresses a litheness which indicates symmetrical conformation concealing powerful muscular development. Such an animal when framed on the lines hereafter mentioned will invariably be capable of high annual milk production; and, broadly speaking, the more closely a herd of cattle approaches this ideal in its individual members the higher will its average dairy production be.

VALUE OF TYPE.

Just as there are exceptions to other rules, so also are variations from accepted dairy type to be found in all dairy breeds. Occasionally a coarse and somewhat clumsy-looking cow has proved a good producer, but it would be most unwise to use such an animal in stud-breeding work with the expectation of her quality being reproduced, for it is almost certain that her progeny would not prove satisfactory as dairy stock. The experience of very many generations of stock-breeders has been that certain types of animals must be bred for certain purposes if the highest degree of success is to be attained, and persistent disregard of this will result in certain failure. Accepted dairy type must therefore be the first point considered in the selection of the breeding stock if high dairy production is to be maintained. It is for this reason that every farmer should become as proficient in this subject as his eye will permit; and all his selections of dairy stock for breeding purposes should be made in close conformity with true dairy type. Illustrations of dairy types appear on pages 648 and 650, and a general description thereof is also supplied.

THE TYPICAL POINTS.

THE HEAD.

In the selection of all stud stock the shape and character of the head is highly important. It is one of the main indications of breed. Whether it is fine or coarse and of reasonably correct shape and size is so largely considered a guide to the other sections that, in the judging ring, any serious departure from a typical head will usually put an animal out of competition. Besides being the first section to catch the eye, and thus conveying a first and telling impression, the head carries much indication of an animal's temperament, and this is an important factor in dairy production. A coarse-headed animal will not be fine in other sections. Also shape and size of mouth, nostrils, eyes, ears, and horns make up the typical head; and each of these parts gives some clue to the peculiarities of each individual animal.

In size the head should be proportionate with that of the body, and shaped according to the breed of the animal. As with all other parts of the body of a well-bred dairy cow, the skin and hair of the head should be fine in quality and soft to the touch. The horns should be shaped and carried according to the peculiarity of each breed, but they should be always fine in grain, somewhat thin, and tapering neatly to the points; such will materially add to the appearance of any show animal. The ears must be fine in quality with thin hair, and their movement will be indicative of the temperament of the animal as to alertness. The eyes should be large, prominent, and bright, a sunken small eye being usually accompanied by a sluggish disposition, while dullness is suggestive of ill-health. The mouth should be broad, allowing for strong teeth, which should meet evenly against the pad or gum in the upper jaw, giving that breadth and depth essential to maintain a long-lasting set of teeth on all kinds of grazing. An animal with an undershot jaw is referred to as being pig-mouthed, and this is considered a deformity; while the failure of the teeth to meet the upper jaw properly places the animal at a great disadvantage in grazing, more especially on short pasture.

Wide nostrils will usually accompany the broad muzzle, and are considered to indicate good lung development. Thick skin or much loose skin below the jaws is not favoured, as this gives the animal what is known as a " throaty " appearance; and for the reason that any thickening or unevenness below or to the back of the jaws may be considered as suggestive of disease in those glands which lie under the skin at that part, all such animals may well be avoided by inexperienced persons when buying.

NECK AND SHOULDER.

The neck should be moderately long, tapering off neatly from head to shoulder, the top line running almost straight from the back of the head to top of shoulder at wither, making just the slightest inclination towards a curve between head and shoulder. The bones of the shoulder blades should be broad and flat, and running thin at the top should leave the wither narrow across and lean of flesh, the typical dairy cow carrying no flesh along the back bone from head to tail. A lean neck running evenly into the shoulder will leave both the wither at the top and the brisket underneath clean and free from coarseness.

SHANKS.

The fine quality of the bone in the well-bred cow or heifer will be very noticeable in the shanks and hoofs, which will be neat and trim in appearance. If running on soft land, the hoofs may occasionally grow long and require trimming, but on ordinary grazing land they should wear evenly and maintain a trim, tidy appearance.

BACK AND BODY.

While the wither should be narrow, and the shoulder bones meeting them thin, the shoulder blades below should spread well apart to give breadth of chest; and behind this the body should widen out still more, consequent on the ribs being well hooped out from the backbone. The top line of the back, while rising slightly, should appear almost straight from shoulder to butt of tail, showing a lean, well-knit spinal column from which the ribs arch out evenly, giving breadth to the body as well as robust appearance. The ribs should be wide in bone and set close together. The loin should be wide and strong, and the joints of the backbone closely knit. The large body of a typical dairy cow is a big weight on the backbone, and unless it is closely knit at the joints, the animal will soon sag from the loin and become unshapely. This even widening out from between the shoulders to the middle of the body in front of the flank gives full room for heart and lung movement, and allows of ample stomach capacity for consuming and digesting the large quantity of fodder essential for the production of a heavy flow of milk.

HIND-QUARTERS.

The hips should be spare of flesh and set wide apart, the front pin bones being set well forward above the flanks and level with the backbone, thus giving a broad, square-topped appearance to the rump, and allowing for good udder development below. The thighs must be broad on the side, but lean when viewed from the rear; and with the hind legs set straight under the wide hips there will be full room for the expansion of the udder when the cow is in full milk without unduly hampering her action in walking. The tail should be fine in bone, tapering off from the back bone to the hocks, where a switch of fine quality hair should finish it off neatly. It must be set squarely on to the rump, the butt being level with the backbone, and it should hang almost straight from the end of the back to the tips of the hocks when the animal is standing, thus giving a neat right-angle finish to the body.

SKIN.

The skin of a healthy and properly conditioned milking cow should feel soft and pliable, lifting easily from the rib. Some judges have a decided preference for yellow colour of the skin inside the ears, on the escutcheon, and on the tip of the tail, considering this as an indication of rich quality milk, probably because this skin colouring is general in stock of those rich-milking Channel Island breeds—the Guernsey and Jersey. Thick, dry, or harsh skin is not desirable, for thickness of skin is generally accompanied by coarseness in bone, and such animals are more liable to fatten under good feeding than to give a heavy and sustained milk yield, while dryness of the skin is usually a sign of unthriftiness from some cause.

UDDER.

The udder or mammary gland, being the organ wherein the conversion of the blood into milk and butter-fat takes place, is considered the most important part of the dairy cow. In the judging of the special dairy breeds of Ayrshires and Jerseys, the udder is allowed about 35 per cent. of the total points allotted to the cow, showing the high value placed thereon by breeders of these cattle. Extra size in udder is not as important as good shape. Some cows with comparatively small udder development are very heavy milkers, but this is not the rule; thus a reasonably large udder is looked for by those expert in choosing a good dairy cow. On the other hand an extra large and pendulous vessel (as the udder is frequently termed) is a hindrance to the free walking action of the cow. It is also more liable to injury when unduly large than when moderate in size and carried close to the body without lateral movement. An unshapely udder makes for uneven milk production from the different quarters. The vessel should also milk out soft, handling even and free of flesh, fleshy-uddered cows usually being anything but heavy milkers.

The teats should be placed evenly towards the centre of each quarter, pointing down, about 2½ inches long, full and even in shape, and not tapering. Dark-coloured teats are preferred, as a white skin is more liable to chap with cold or blister with heat, leaving the teats sore. With any injury to the teats the pain of milking interferes much with the yield, while the work will be protracted owing to the animal kicking. Cows with thin teats, unevenly-shaped teats, or with teats unduly long and thick, are always more difficult to draw the milk from than those having teats moderate in size and evenly-shaped.

The udder should extend well forward on the underline of the body, and also carry well up to the rear, conforming as evenly as possible with the body line, and without any bulging or baggy formation. When full it will then extend evenly, and the teats, when properly placed, will still point down, giving the vessel a neat appearance.

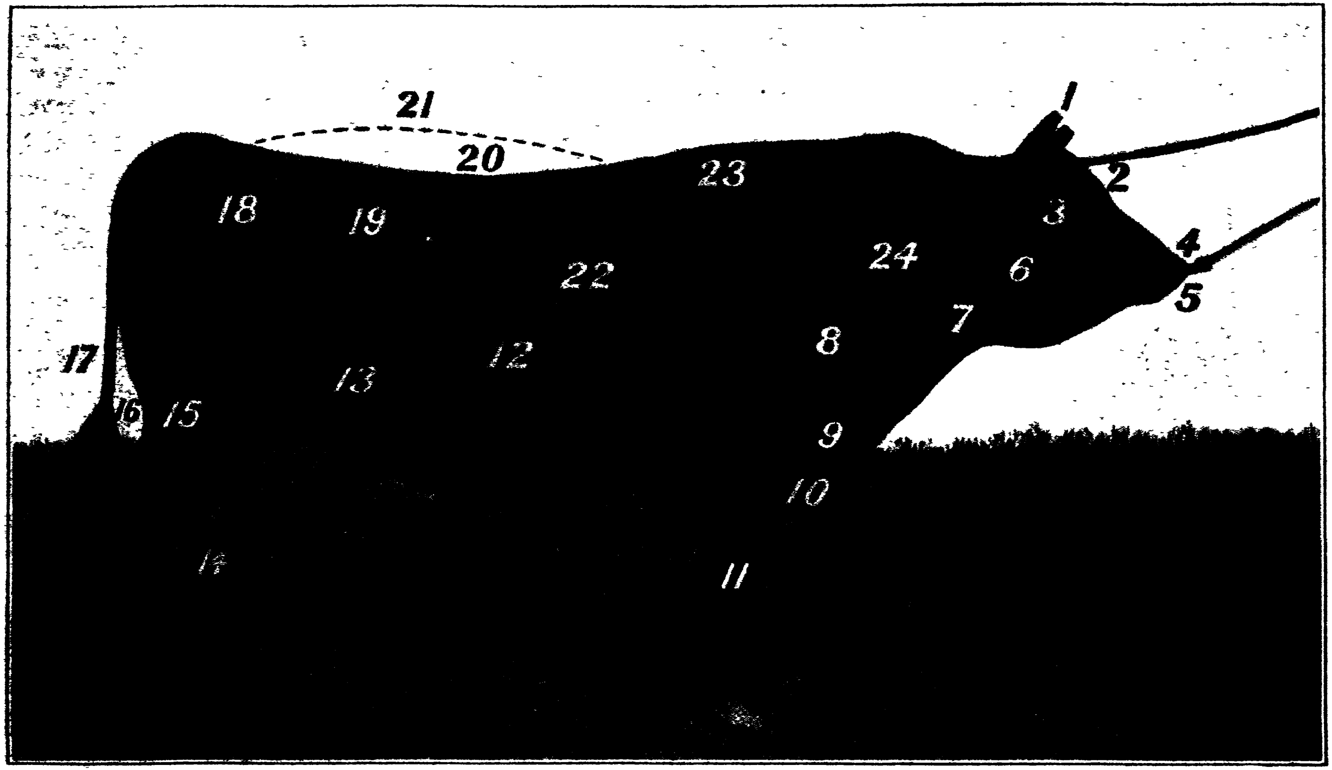
More particularly with heifers, for some little time before and after calving the udder may become inflamed by the extra flow of blood, causing a flagging or swelling of the surface and underlying tissue, and the process of milking may then become exceedingly painful to the animal. With this flagging the milk is not affected, and with regular and clean milking out twice or three times daily, preceded and followed by hot fomentations, in a week or so the udder should resume its natural soft condition, free of all lumps or thickening of tissue, unless otherwise affected by disease or injury.

MILK VEINS.

With fine-skinned, heavy-milking cows the so-called "milk veins," which are really blood vessels, show out prominently underneath the skin of the body on each side. Those running from the udder towards the fore-legs disappear in the so-called "milk wells," which are orifices from one-half to a quarter of an inch in diameter about midway between the navel and the fore-leg on each side of the underneath part of the abdomen. Prominent "milk veins" and large "milk wells" are usually an indication that the animal is a very heavy milker.

ESCUTCHEON.

The thin skin at the rear of the thighs and immediately above the main portion of the udder—over which the hair lies upwards—is known as the escutcheon. Several of the points connected therewith are worth study as a guide to the ability of an animal to produce milk under suitable conditions, and as to the length of time a good yield will be maintained. This subject has been dealt with in a separate article.



Typical Dairy Bull.
For explanation of numbers see opposite page

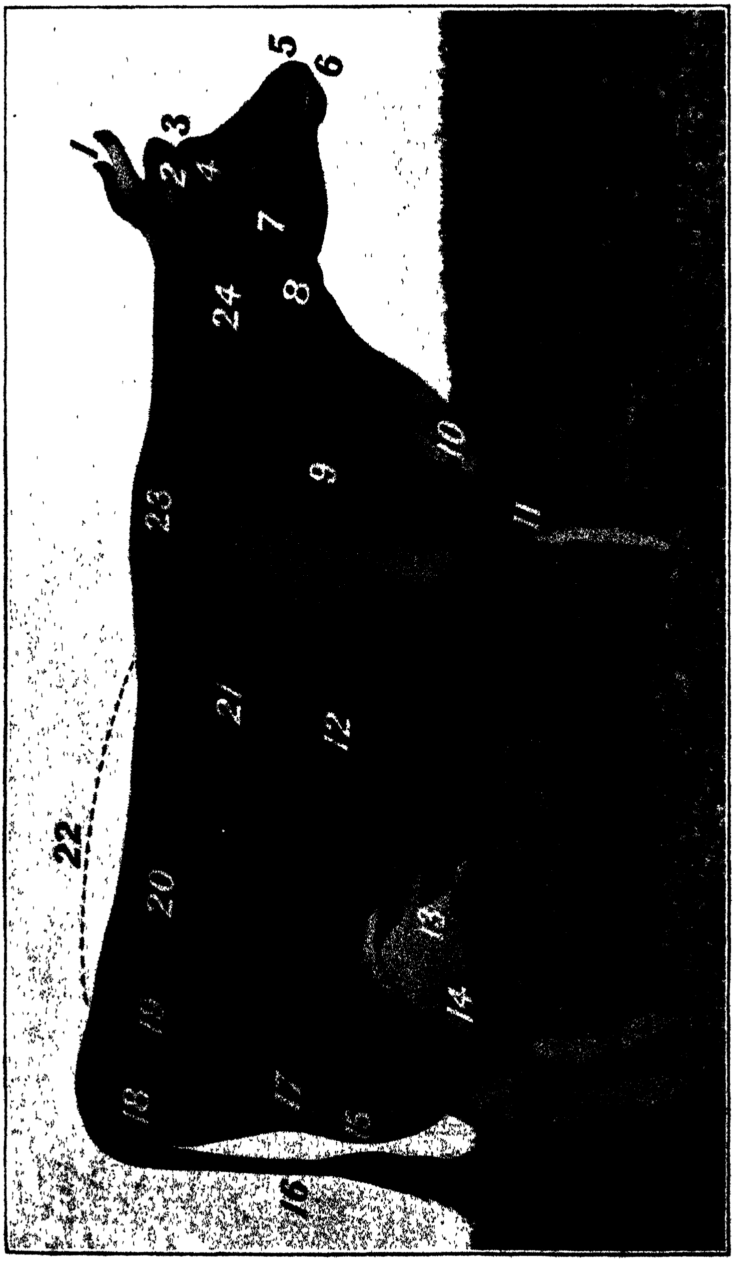
Points of a Typical Dairy Bull.

1. Horns—fine in quality, and shapely.
2. Forehead—broad.
3. Eyes—large and bright.
4. Nostrils—wide.
5. Muzzle—broad and deep.
6. Jaw—strong, but clean-cut.
7. Throat—clean, with fine skin.
8. Shoulder—broad flat bone.
9. Chest—broad and deep.
10. Brisket—lean and light.
11. Fore Legs—fine in bone, wide apart, and straight under body.
12. Barrel—long, broad, and deep.
13. Flank—deep and lean.
14. Shanks—fine in bone.
15. Hind Legs—straight, set well apart.
16. Thighs—lean.
17. Tail—long, fine, and tapering.
18. Rump—long, broad, and level across top.
19. Hip Bones—prominent and wide apart.
20. Back—broad across loin.
21. Back—long, and fairly straight.
22. Ribs—well hooped, with soft pliable skin.
23. Wither—lean, sloping off to shoulder.
24. Neck—fairly long and strong, but lean.

Remarks on Photograph.

The photograph reproduced on the opposite page is of a Jersey bull which is a very good specimen of its breed; but the picture does not show the animal to advantage. It possibly was in a combative mood, for it has been taken with both head and hindquarters slightly turned away from the camera. This has thrown the shoulder outward, making the bone look round in shape rather than flat. The tips of the horns have been sawn off. The nose is pulled somewhat forward by the rope attached to the leading ring. There is the usual amount of loose skin below the jaw that is found in mature bulls, but the shape of the jaw is clearly defined, showing that the skin is fine in quality. The left front leg is not properly discerned owing to the shadow falling across it.

The body of this bull is fairly well developed, but the picture shows a slight hollow over the loin, which is mainly due to the position in which the bull was standing. The rump being turned away has made the animal look short between pin and hip bones; while the apparent fullness of the buttock is also due to the same cause, giving a fleshy, rather than a lean, appearance at that part. The junction of the tail with the backbone also appears too far forward, and the picture does not illustrate the square finish to the bull's body so much appreciated by breeders.



Typical Dairy Cow.

For explanation of numbers see opposite page.

Points of a Typical Dairy Cow.

1. HORNS—fine and shapely.
2. EARS—thin.
3. FOREHEAD—broad.
4. EYES—large and bright.
5. NOSTRILS—wide.
6. MUZZLE—broad and deep.
7. JAW—clean, with thin skin.
8. NECK—lean and shapely.
9. SHOULDERS—broad flat bone.
10. BRISKET—thin and light.
11. FORE LEGS—fine in bone, straight, and set wide apart.
12. BARREL—long, broad, and deep.
13. UDDER—carrying well forward.
14. TEATS—squarely placed, and pointing down.
15. UDDER—evenly full at rear.
16. TAIL—long, tapering, with fine hair.
17. THIGHS—lean, set wide apart.
18. PIN BONES—prominent, and set well apart.
19. RUMP—long, broad, and level across.
20. HIP BONES—prominent, and wide apart.
21. RIBS—well hooped, with skin soft and loose.
22. BACK—broad and straight.
23. WITHER—fine, sloping out to shoulder.
24. NECK—long and lean.

Remarks on Photograph.

The reproduction of the cow shows a Jersey of excellent type. Her head may be a little long to suit some critics. The picture has been taken with the hind legs a little too far forward. This has made the rump look much higher than the shoulder, and, by giving a somewhat crouching attitude to the hindquarters, it has thrown the hinder part of the udder too far out. The body is well developed, and the milk veins can be plainly seen along the belly in front of the udder. The vessel might carry a little more straight forward and level where it junctions with the body, instead of rounding up short as illustrated.

The photographs are the best that could be found for reproduction from amongst a large number, and any one in possession of animals such as these should be able to win many show-ring prizes on type.

ACTION.

The walk or action of the dairy cow should be free, graceful, and active in proportion to its size, and its size should be medium in conformity with its breed. Either undersized or extra large animals of any breed are usually not the best producers or breeders, medium-sized stock being most generally satisfactory for dairy work, and breeding more true to type. Heavy-framed animals are inclined to be sluggish, and, except on the best of country, are anything but good foragers. Stock unduly light in frame are not properly developed, and when well bred are frequently of such nervous temperament that it interferes with their dairy production.

SYMMETRY.

This is a term applied to the even balance which should exist between the several sections of an animal as viewed from the stand-point of proper development. The size, shape, and general conformation of each and every part should harmonize correctly with the rest, giving the animal an evenness of outline which is pleasing to the eye; and a study of these pages will have shown that in every section such desired development has also a sound utility basis.

OTHER FEATURES.

There are other points connected with the selection of good dairy cattle which individual buyers or judges may show special preference for, such as colour, shape of horns, length of leg, &c., but which have little bearing on the general type of dairy stock, being rather breed peculiarities. The observant dairy farmer will soon note these, and probably through meeting with a few good cows, or a few unsatisfactory ones, with some common characteristic in shape or colour, he also may become prejudiced in a similar way to those mentioned as regards some particular point. For instance, many of those who deal in crossbred cattle are partial to brindled animals, which possibly arises from this colour frequently occurring through a cross of the Jersey breed, which has also given good dairy quality. Some have a fancy for blue, roan, or strawberry markings, while others come close to fact when they say that a good cow cannot be of a bad colour, thereby expressing their opinion that colour is little guide to dairy quality.

ORIGIN OF DAIRY TYPE.

It is an indisputable fact that the points set out here in detail are generally accepted in all countries as indications of high dairy quality, and cows which conform closely to these will, with proper feeding, rank high as milk producers irrespective of their breed. There are occasional exceptions to this, for at times some promising-looking animal may not come up to expectation in production. This, however, most probably will prove to be a matter of temperament, as some highly-bred cows are extremely nervous in disposition, and through not being handled in the most suitable way may prove disappointing as producers. Again, while a big and somewhat coarse-looking cow may turn out to be a very heavy milker, usually such cattle do not sustain a good flow of milk for more than four or five months—if even that long—so that, broadly speaking, good dairy type is invariably accompanied by satisfactory dairy production and *vice versâ.*

The combination of the several points which constitute what is known as good dairy type is nothing more or less than the result of the experience of generations of stock-breeders. Long study of cows has shown that the great majority of good milk-producers are of this conformation, the evidence on this point being so strong that in every dairying country and with every dairy breed such conformation is recognised as "dairy type."

BUTTER-FAT QUALITY.

Dairy type, however, covers only milk production. So far nothing is known which gives any definite guide to the butter-fat quality of a cow's milk other than her breed. Nothing short of the actual test of samples taken at two consecutive milkings during the third, fourth, and fifth months of the lactation period will provide a reliable guide to the average butter-fat quality of any cow's milk. From data obtained through official herd-test work regarding different breeds of cattle a reasonable estimate may be made of the average of a herd of any one of the more popular breeds, but between individual cows of any of these breeds there may be a difference in the quality of the milk amounting to even more than 40 per cent. of butter-fat. This can only be discovered by actual test, and this fact no progressive dairy farmer can afford to ignore.

THE INFLUENCE OF HERD-TESTING.

The influence of herd-testing is frequently very manifest during the second testing season for the herd. For example, among the herd-testing associations whose computations were made at the headquarters of the Dairy Division during 1920-21 and 1921-22 there were some 218 herds which were tested in both these seasons. The yield of the average cow in these herds increased from 213 lbs. to 253 lbs. of butter-fat, or about 19 per cent. Even granting that some portion of this increase may have been due to the fact that 1921-22 was a better season for grass, much of the improvement is undoubtedly due to knowledge gained as the result of the previous season's testing. In these herds the number of cows tested each season was very similar. Our figures show that often dairy farmers reduce their herds as the result of testing, and still maintain the total yield of the herd. We also have data which show that in certain cases during a second testing season, with only two-thirds of the previous season's herd, the total butter-fat produced underwent no reduction, while one dairy farmer during his first testing-year milked twenty-three cows to produce as much butter-fat as did sixteen which he milked two seasons later.

Instances which bear out the same principle could be multiplied.—W. M. Singleton, Director of the Dairy Division, in the New Zealand *Journal of Agriculture.*

RESULTS OF POTATO EXPERIMENTS, 1922-23.

J. T. Ramsay, Potato Expert.

The results of these trials, conducted by the Department of Agriculture during the past season, are herewith submitted. With the exception of the Korumburra and Catani (late Modella) districts, the others suffered severely from an extremely dry spell of weather from the date of planting until harvesting. The yields consequently are relatively low as compared with those obtainable in a normal or favorable season. One fact, however, clearly demonstrated is that judicious expenditure on manures for application to the potato crop is a sound and profitable investment.

In addition to the manures tested and tabulated below, lime (ground limestone), at the rate of 1 ton per acre, was tried on sections of each of the three fields at Catani, Kinglake, and Thorpdale, but in no case was there any appreciable increase in the crop obtained.

In computing the cash value of the returns, the crop has been calculated at the value of £10 per ton. While this is a high rate, it is justifiable to use it for this season's crop, owing to the very high values per ton which potatoes have realized. At the date of writing the market quotation for prime samples is £17 10s. per ton.

In the tabulation of the results, the rates per acre, and varieties of manures applied are given, together with tonnage and percentage increases due to manures, cost of manures, and the value of crop resulting from the varied treatments. The respective performances, expressed in terms of £ s. d., can be seen at a glance.

Potato Trials, Millbrook, 1922-23.

MANURES SECTION.

Plot.	Manure per Acre.	Yield.			Increase due to Manure.			Increase from Manure.	Manure Cost per Acre.			Value of Crop per Acre at £10 per Ton.		
		t.	c.	qr.	t.	c.	qr.	%	£	s.	d.	£	s.	d.
1	2½ cwt. Super. ..	4	2	0	1	17	0	82	0	16	3	41	0	0
2	2½ cwt. Super. 1 cwt. Sulp. Potash	4	18	0	2	13	0	117	1	18	6	49	0	0
3	2½ cwt. Super. 1 cwt. Sulp. Ammonia	4	3	0	1	18	0	84	1	14	3	41	10	0
4	2½ cwt. Super. 1 cwt. Sulp. Potash 1 cwt. Sulp. Ammonia	4	18	0	2	13	0	117	2	16	6	49	0	0
5	2½ cwt. Market Garden	4	3	0	1	18	0	84	1	0	0	41	10	0
6	2½ cwt. Basic Phosphate	3	18	0	1	13	0	73	0	13	3	39	0	0
7	No Manure	2	5	0	..			..	..			22	10	0

VARIETY SECTION MANURED WITH 2¼ CWT. SUPERPHOSPHATE PER ACRE.

Late Varieties.					Early Varieties.				
Name.	Yield.				Name.	Yield.			
	t.	c.	qrs.	lbs.		t.	c.	qrs.	lbs.
Carmen	5	8	2	0	Earliest of All ..	3	0	1	0
Red Ohio	4	10	0	0	American Wonder ..	2	2	0	0
Brownells	4	7	2	0	Peerless	2	2	0	0
Duchess	3	15	0	0	White Rose ..	2	2	0	0
Minatio	5	0	0	0	Manistee	1	13	3	0
Manhattan	3	12	0	0					
Brown's River	3	12	0	0					
Clark's Main Crop ..	1	12	0	0					

SELECTED SEED SECTION.

Carmen III.	Yield.				Increase from Selection.				Per cent. Increase.	Value of Crop at £10 per Ton.		
	t.	c.	qrs.	lbs.	t.	c.	qrs.	lbs.	%	£	*s.*	*d.*
I. Selected seed from plants giving 10 tubers or over	5	14	0	0	1	12	0	0	31	57	0	0
II. Selected seed from plants giving 7 to 9 tubers ..	5	12	0	0	1	10	0	0	28	56	0	0
III. Seed from the run of the crop 4 to 6 tubers per plant	4	7	0	0	..				..	43	10	0
IV Seed from plants giving under 4 tubers ..	4	2	0	0	−0	5	0	0	−5	41	0	0

Minus (—) signifies decrease.

In view of the haphazard method of seed saving common to most growers the above Selected Seed Table is of considerable importance. The treatment given to the four classes of seed was identical in the makers of soil, cultivation, and manuring. It may be fairly assumed that 95 per cent. of the crop grown in the Commonwealth is planted with seed of class number III., *i.e.*, the run of the crop. Yet with a little attention to selection, as illustrated above, the yield can be increased by over 25 per cent. It is not suggested for a moment that large growers should go to the trouble, in any one year, of selecting seed of high standard sufficient to plant their whole acreage. It is strongly advocated, however, that each season a small quantity of seed should be obtained from plants of high prolificacy and true type from which a stud plot for the production of seed for the following year may be grown. By this means it would only take a year or two to produce high-quality seed ample to plant a large area.

Korumburra Results, 1922-23.

MANURE TRIALS.

Plot	Manure per Acre.	Yield			Manure Increase.			Per cent. Increase.	Manure Costs.			Value of Crop per Acre at £10 per Ton.		
		t.	c.	qr.	t.	c.	qr.	%	£	*s.*	*d.*	£	*s.*	*d.*
1	5 cwt. Super. ..	7	10	0	2	7	0	45	1	12	6	75	0	0
2	5 cwt. Super. 1 cwt. Sulp. Potash	7	0	0	1	17	0	36	2	14	9	70	0	0
3	5 cwt. Super. 5 1 cwt. Sulp. Ammonia	7	4	2	2	1	2	40	2	10	6	72	5	0
4	No Manure .. .	5	3	0		..		..		..		51	10	0
5	5 cwt. Super. 1 cwt. Sulp. Potash 1 cwt. Sulp. Ammonia	9	16	0	4	13	0	90	3	12	9	98	0	0
6	5 cwt. Market Garden	9	19	0	4	16	0	93	2	0	0	99	10	0
7	5 cwt. Basic Phosphate	8	16	0	4	13	0	70	1	6	3	88	0	0

Catani Results, 1922-23.

MANURE TRIALS.

Plot	Manure per Acre	Yield			Increase due to Manure.			Increase due to Manure.	Manure Cost per Acre.			Value of Crop per Acre at £10 per Ton.		
		t.	c.	qrs.	t	c.	qrs.	%	£	*s.*	*d.*	£	*s.*	*d.*
1	5 cwt. Basic Phosphate	5	8	0	2	8	0	80	1	6	3	54	0	0
2	5 cwt. Basic Phosphate 1 cwt. Sulp. Potash	5	16	2	2	16	2	98	1	17	5	58	5	0
3	5 cwt. Bone and Super.	6	10	0	3	10	0	116	2	0	0	65	0	0
4	5 cwt. Bon and Super. 1 cwt. Sulph. Potash	6	8	0	3	8	0	113	3	2	3	64	0	0
*5	No Manure .. .	3	6	0		.		..		..		33	0	0
6	5 cwt. Super. ..	6	8	0	3	8	0	113	1	12	6	64	0	0
7	5 cwt. Super. 1 cwt. Sulp. Potash	4	18	0	1	18	0	63	2	14	9	49	0	0
8	5 cwt. Super. 1 cwt. Sulp. Potash 1 cwt. Sulp. Ammonia	5	18	0	2	18	0	89	3	12	9	59	0	0
9	2 cwt. Super. ..	3	15	0	0	15	0	25	0	13	0	37	10	0
*10	No Manure	2	14	0		..		..		..		27	0	0

* Average return from two no-manure sections taken for comparison with manure results.

Kinglake Results, 1922-23.

Plot.	Manure per Acre.	Yield.			Variation due to Manure			Increase or Decrease due to Manure.	Manure Cost per Acre.			Value of Crop per Acre at £10 per Ton		
		t.	c.	qrs.	t.	c.	qrs.	%	£	s.	d.	£	s.	d.
1	5 cwt. Super. ..	2	13	0	0	6	2	15	1	12	6	26	10	0
2	5 cwt. Blood .. .	2	5	1	–0	1	1	– 2	2	0	0	22	12	6
3	5 cwt. Bonedust ..	2	11	3	0	5	1	11	2	2	6	25	17	6
4	1 cwt. Nit. Soda .	2	15	2	0	9	0	20	1	0	0	27	15	0
5	No Manure	2	6	2		..		..		.		23	5	0
6	1 cwt. Magnesium Sulp.	1	17	2	–0	9	0	–20	2	0	0	18	15	0
7	5 cwt. Market Garden ..	2	19	2	0	13	0	28	2	0	0	29	15	0
8	5 cwt. Super .. 1 cwt. Sulp. Potash	3	2	0	0	16	0	34	2	14	9	31	0	0
9	5 cwt. Super. 1 cwt. Sulp. Potash 1 cwt. Sulp. Ammonia	2	11	3	0	5	1	11	3	12	9	25	17	6

Minus (–) signifies decrease.

Thorpdale (Childers) Results, 1922-23.

Plot	Manure per Acre	Yield			Increase due to Manure.			Per cent. Increase from Manure	Manure Cost per Acre.			Value of Crop per Acre at £10 per Ton		
		t.	c.	qrs.	t.	c.	qrs.	%	£	s.	d.	£	s.	d.
1	5 cwt. Super.	4	17	1	2	13	1	120	1	12	6	48	12	6
2	5 cwt. Super. .. 1 cwt. Sulp. Potash	4	7	1	2	3	1	98	2	14	9	43	12	6
3	5 cwt. Super. .. 1 cwt. Sulp. Ammonia	4	13	0	2	9	0	111	2	10	6	46	10	0
4	No Manure	2	4	0		..		..		..		22	0	0
5	5 cwt. Super. .. 1 cwt. Sulp. Potash 1 cwt. Sulp. Ammonia	6	9	0	4	5	0	193	3	12	9	64	10	0
6	5 cwt. Market Garden ..	5	11	0	3	7	0	154	2	0	0	55	10	0
7	5 cwt. Basic Phosphate	4	9	0	2	5	0	102	1	6	3	44	10	0

It is not possible in any one season to secure data from which a hard-and-fast law of manuring on any given soil or crop may be laid down. This can only be reasoned out from the average of a number of results, and the greater the number from which the average is derived the less margin there is for error in the ruling given.

This must at once be apparent when the climatic variations of seasons, such as temperatures, quantities and times of rainfall, &c., are considered.

Such being the case, the following average table is given to show this season's action and monetary return from manures commonly used. The trials selected to furnish figures from which averages could be derived are:—Korumburra, Catani, and Thorpdale, for the following reasons:—

I. These three fields are situated in Gippsland, which portion of Victoria supplies the bulk of the potatoes produced in the State.

II. They represent three distinct classes of soil which are typical variations of extensive areas devoted to potato growing.

III. The past season was fairly normal in weather conditions in these three centres.

IV. The manures tested are commonly used by the growers in Gippsland.

The average of the results obtained strongly favour the use (I.) of market-garden manure, and (II.) of a complete compound manure.

Something of a problem presents itself by the fact that sulphate of potash in combination with superphosphate depressed the yield as compared with superphosphate alone, though the combination of superphosphate and potash, plus sulphate of ammonia was one of the outstanding successes. The performance of basic phosphate—a medium grade phosphate manure (none of which is water soluble)— is worthy of notice.

POULTRY NOTES FROM STATE RESEARCH FARM, WERRIBEE.

By W. O. Pederick, Poultry Foreman.

November is the time to cull. Cockerels not required for stud purposes should be disposed of as they become old enough. The growing pullets at the Research Farm are given as much liberty as possible; those on free range do not require meat; a plain dry mash is always available, and they are liberally fed on grain.

Chickens still in the chicken house are given plenty of space; such a precaution is necessary, as overcrowding hinders growth and development. All hens that will not be required for another season's breeding are now being marketed to make room for the growing stock.

With the approach of warmer weather extra green stuff is added to the morning mash, and the layers are fed chaffed green stuff after their grain food at night.

Minced raw onions are mixed with the morning mash at least once a week; this addition helps towards good health amongst the birds.

A sharp look out is kept for vermin, both on the birds and in the houses.

Dust baths are provided and moistened on the warm days.

POMOLOGICAL COMMITTEE OF AUSTRALIA.

REPORT OF ANNUAL MEETING, 1923.

E. E. Pescott, F.L.S., Secretary.

The tenth meeting of the above Committee was held at the Science Branch, Department of Agriculture, on the 5th and 9th May, and continued at Harcourt on 11th May.

There were present:—Messrs. H. Wicks (Chairman), W. Tilling, representing South Australia; J. H. Lang, A. S. Neilson, A. F. Thiele, J. W. Lawrey, J. R. Warren, W. G. Gray, G. Peart, G. Russ, F. W. Vear, J.P., James Lang, J.P., representing Victoria; T. MacMahon, A. Goodhew, representing New South Wales; Hon. L. M. Shoobridge, M.L.C., representing Tasmania. Messrs. W. J. Allen (New South Wales), Geo. Quinn (South Australia), G. W. Wickens (Western Australia), J. N. Ward (Queensland), P. H. Thomas (Tasmania), and E. E. Pescott, F.L.S., Secretary (Victoria) represented the Departments of Agriculture of their States. There were also Mr. Peart, manager of the Shepparton Cannery; Mr. Thompson, representing Henry Jones & Co., of Hobart; Mr. Taylor, representing the Australian Jam Company; Mr. E. Meeking, representing the Quarantine Department; and Messrs. Piggott, M.L.A., Tasmania; and Randall, M.H.A., South Australia; W. Everard, M.L.A., Victoria.

After the President had addressed the members, and the Secretary had read the 1922 report, Lieutenant-Colonel J. H. Lang, V.D., was elected Chairman for the ensuing year.

The Hon. L. M. Shoobridge in an address, briefly outlined the history of the committee and its work, and complimented the committee on now having official representatives from every State in the Commonwealth, representatives of the growers, nurserymen, and canning and jam factories as well.

Sub-Committee Reports.

1. SOUTH AUSTRALIA.

This sub-committee met in January to consider the identity and nomenclature of the Trevatt apricot. Fruits sent from Yanco I. Settlement, New South Wales, were compared with fruits grown at Blackwood, South Australia, and with fruits of Leewood Perfection, grown at Blackwood. The committee considered that the three fruits were identical, and at Blackwood it was found that they develop and ripen simultaneously. The apricot known as Trevatt should therefore be called Leewood Perfection. This apricot was raised as a seedling from Moorpark, about forty years ago, by the late Edwin Smith, of Leewood Garden, Glen Osmond-road, and Clifton Nurseries, Walkerville.

The sub-committee further reported that comparisons were made between fruits of Trevatt and Blenheim (Shipley's) as grown at Blackwood, and the opinion was that these are in no way identical, either in the character of the fruits, or the seasons of ripening. Further, the Trevatt fruits are quite distinct from the Royal varieties, whether grown from locally procured stock or from trees imported direct from California. The committee formed the opinion from the fruits and the literature of other countries that the variety grown at Blackwood as

Shipley's Blenheim is correctly named, but the tree bearing the name of Blenheim only, received from Hawter, Western Australia, is identical with the Californian Royal.

In the Blackwood collection, besides this tree from Hawter, there are trees labelled Royal, received from H. Wicks, 1908: Californian Royal, from the same nurseryman, received 1908; American Royal, received from Hawter, planted 1908; and simply Royal, from H. Wicks, planted 1908, all of which are identical. The tree at Blackwood labelled Newcastle Early, received from Searle, New South Wales, and planted 1910, is also identical with Royal.

The variety labelled St. Ambroise, received from Nobelius, and planted 1908 at Blackwood (ripe mid-January at Blackwood) is incorrectly named, and has a close resemblance to Moorpark and Heemskirk, though ripening slightly later The fruit of the St. Ambroise ripens much earlier than this, and is more flattened in shape and higher coloured on exposed side.

Two trees at Blackwood labelled Tilton, one received from Nobelius, and planted 1908, and the other worked from a tree imported direct from Roeding, California, and planted 1915, are distinct in both fruit and foliage. The leaves of the former are more conspicuously serrated, and the stone round and smooth. The stone of the latter is large, flat and rough.

Mr. Allen stated that at Yanco, Trevatt apricots kept longer than Leewood, although the varieties are generally identical.

Mr. Quinn promised to report again next year

2. NEW SOUTH WALES.

Grunsell's Late Red apple takes woolly aphis, but is free from black spot.

Mill's Late Keeper (Milbert) cropped well at Bathurst, but woolly aphis is showing. This apple keeps out of cool storage until November.

Bonum apple at Bathurst is showing no signs of woolly aphis. The tree crops well, but the fruit is of a dull colour.

Scions of Tenterfield, Royal Snow, Goulburn Beauty, Duke of Wellington, Winter Strawberry apples, and Beauty of Colac pear are all growing well at Bathurst.

3. VICTORIA.

A meeting was held in January, to consider a new raspberry, Exton Late, and a specimen of Golden Delicious apple received from Stark Brothers, of America, per Mr. J. R. Warren, J.P.

The raspberry, Exton Late, was raised thirteen years ago by Mr. C. Exton, Kinglake. The fruit is larger than the Fillbasket, and commences to ripen just when that variety is finished. Thus the raspberry season is extended for nearly a month. The fruit bunches are carried on a considerable number of axillary clusters. At Kinglake the season extends from about 18th January to 24th February. The sub-committee recommended its approval; and the general committee asked for a fuller report next year, in view of the favorable report.

Stark's Golden Delicious Apple.—Fruits of this apple were sent to Mr. J. R. Warren, by Stark Brothers, of Louisiana, United States of America. The fruit had been submitted to severe travelling tests by the senders before despatch to Australia. It arrived in excellent condition. The sub-committee reported: "The appearance is most striking; appearance very good, and flesh firm. The quality is very fine and the flavour very good. The apple is not 'Delicious' in shape, and the name may thus be somewhat misleading. The core is exceptionally small for such a large apple." It was recommended that the various State Governments be asked to obtain sample trees for testing in their States.

Plums.—Two seedling Japanese plums, sent by Messrs. A. Chandler and G. Russ, are to be reported upon next year.

General Business.

BLACK END IN PEARS.

The question being asked as to what progress had been made in the knowledge of this disease, the Secretary reported that Mr. C. C. Brittlebank, Plant Pathologist, Victoria, had attempted by many cultures to isolate an organism causing the trouble, but had always failed. Mr. Brittlebank suggested that the trouble might be a "stock" one.

WOOLLY APHIS REPORTS.

The secretary reported having sent out over one hundred copies of the woolly aphis reports to various societies in the Commonwealth. Very few replies had been received. Among those was one from the Department of Agriculture, Victoria. Mr. Allen's report covered all the varieties in the New South Wales experiment orchards; Mr. Quinn's report covered 1404 varieties grown at Blackwood.

The reports were general that the first season had been a prolific one for woolly aphis. It was agreed that observations be taken each year and noted in conjunction with the season. Reports were general that some tobacco solutions, and especially Black Leaf 40, were the best remedies for this pest. It was considered that "Nicotox" may not be so cheap as this former spray. Soap has been used as a "spreader" in several places with success. In Tasmania the aphis was far worse in the warm and dry districts than in the cold and wet localities.

Parasites of the aphis were discussed, especial reference being made to New Zealand experiences. It was reported that, in the Dominion, parasites were now being freely bred. At the orchard of Mr. W. G. Gray, in Victoria, potash mixed with tobacco water had been used in the dormant season with excellent success. In Tasmania, Mr. Thomas found that a spray of red oil, given as late as possible, using from 1 in 10 to 1 in 15, followed by a spray of Black Leaf 40, in the first arsenate of lead spray gave good results.

Mr. Wicks considered that a second spray within 24 hours cleared the trees of aphis. The Chairman, speaking of oil applications, said that in his experience crude petroleum and lime, using 1 lb. lime and 1 gallon of petroleum to 25 gallons of water, was more effective than red oil.

The question of using nitrate of soda or salt sprays was considered, but doubts were expressed as to their value.

THE ETTERSBURGH STRAWBERRY.

Tasmania asked for a report on this berry. The opinion, after discussion, was expressed that the first Ettersburgh Strawberry distributed in Australia, No. 80, the so-called "tree" strawberry, was a prolific cropper, but only a jam berry, and it is not recommended for general planting. Ettersburgh No. 89 is strongly recommended for trial, and for future reports.

FRUIT TREE STOCKS.

The committee decided to recommend that an arrangement be made between the States for some detailed system of investigation into the best stocks for fruit trees.

Mr. Quinn reported that in regard to seedling apple stocks, seedlings are very erratic and show great variation. At Blackwood 340 plum varieties are worked on to the seedling Myrabolan. At Berri, Fellemberg proved very unsatisfactory on this stock, and in many cases, the trees outgrew the stock in diameter.

There are 1,000 varieties of pears at Blackwood, all worked on seedling stocks; many trees are evidently not suited to this stock. It is not yet known whether variation of the stock is the cause.

At Berri a trial of citrus stocks is proceeding. Three trees of each of the following varieties are worked on each stock as follows:—

Variety—

Thompsons, on lemon seedlings.

Navelencia, on sweet orange seedlings.

Buckeye Navel, on Pomelo seedlings.

Mediterranean Sweet, on Poor Man seedlings.

Dancey's Tangerine, on Seville seedlings.

Valencia Late, on Trifoliata seedlings.

Some of the trees are from nine and ten years old. The trees on lemon seedlings are more vigorous and produce more and larger fruit than those on orange seedlings. Those on the other stocks are not yet in bearing. The varieties on *Citrus trifoliata* are doing well.

In cherries, five leading commercial varieties are worked, three trees of each, on Mazzard, Mahaleb, and Kentish stock, and on Mazzard seedlings with Kentish worked as an intermediary. The trees on Mazzard stock, almost without exception, are strong and vigorous, and fair croppers. The Kentish stock gives a moderate sized tree, and good fruit, but the stock suckers regularly and freely. Owing to this suckering the Mazzard was used in the fourth trial, on account of its strong roots, with the intervening piece of Kentish wood, to slightly stunt the tree. A full report will shortly be published.

Mr. Thiele reported that at Doncaster, Victoria, Williams pears—worked on rooted cuttings of Williams—gave a good root system, good spur system, and good crops. Citrus trees are thriving well on *Citrus trifoliata* stock.

COLOUR SPORTS OF FRUITS.

The question of colour sports, especially those from the Rome Beauty apple, was considered for the third time by the committee. Several sports of Rome Beauty have been shown at the meetings. These are Glengyle, Croydon, Panton Hill, Herbert's, Harcourt (all Red Romes); and two from America, Ohio and Washington, both Red Romes. The three latter were considered the finer samples; but the sport from Harcourt, selected by the grower, Mr. C. H. Seelenmeyer, was considered to be the finest of all.

Other colour sports exhibited and discussed were, Red Northern Spy, from Mr. J. Johnstone, Stanley, Victoria, Red Jonathan, from Mr. W. Moyle, Upper Pakenham, Victoria; Red Delicious, from Mr. Frank Walker, Launceston, Tasmania. It was agreed that no colour sport should be known as a separate variety, and the following resolution was carried:—"That Nurserymen's and Horticultural Associations be notified that the Pomological Committee does not recognize colour sports of apples as distinct varieties, and that they be requested to catalogue them only as sports of a particular variety."

Regarding the Red Delicious sport shown for the first time, it was decided that the committee favorably considers this sport, and that a report be given as to its condition next year.

ROME BEAUTY APPLE.

This apple was unfavorably commented upon at the 1922 Conference. The following reports were received this year:—

Mr. Wickens wrote to all Associations in Western Australia, as well as to principal growers in apple growing districts, regarding its value. The replies were unanimous that it was decreasing in favour each year, owing to its susceptibility to woolly aphis. It is also the variety most susceptible to powdery mildew. Growers are planting Granny Smith and Yates in its place.

Mr. Ward reported that growers at Stanthorpe, in Queensland, were working Rome Beauty over to other varieties on account of powdery mildew and woolly aphis.

Mr. Allen stated that in New South Wales the Rome Beauty on the heavier soils lacked colour. The fruit grows too large for Sydney markets.

Mr. Thiele reported that it is grown generally in Victoria, and is one of the best croppers. It is hardy; takes woolly aphis; but has the advantages of a long stem and a good colour.

Mr. Quinn reported that it is grown widely in the cold districts of South Australia, and is recognized as one of the long-keeping cold-storage varieties.

The Chairman reported that in Harcourt it was one of the best varieties grown. In 1922 he had harvested 400 bushels from one acre, and 600 bushels in 1923 from the same acre. He had had Romes 44 to the bushel case in 1923. The great advantage of the Rome Beauty was that with it one received the benefit of the late markets and high prices.

CITRUS NOMENCLATURE.

It was decided that at the 1924 meeting the subject of citrus varieties would be specially considered, and that the co-operation of the growers, nurserymen and Agriculture Departments be invited. It was was also decided that the officers of the citrus-growing States hold special sub-committee meetings this year, and report in 1924 on nomenclature, stocks and other points in citrus culture, including citrus stocks.

CONSIDERATION OF SEEDLINGS.

1. A letter was read from Mr. F. J. Kellaway, of Tasmania, refusing to allow the distribution of wood of his seedling apple for propagation purposes. A motion was carried, that Mr. Kellaway be again urged, in the cause of public utility, to distribute a stock of the wood.

2. Three apples were sent by Mr. H. R. Wright, nurseryman, Auckland, New Zealand—

(*a*) A seedling apple from Delicious (female) x Cox's Orange (male). Tree a strong sturdy grower, and blight proof. Fruit a good keeper. Colour good, flavour very good. Stem rather short.

(*b*) A seedling apple from Ribston Pippin (female) x Northern Spy. Tree a vigorous grower and a heavy cropper, resembles the Northern Spy in habit, and is blight proof.

(*c*) A dull-coloured sport of (*b*).

The raiser reported that (*b*) will hang on the tree until June, while (*a*) can be gathered in March.

The committee reviewed (*a*) and (*b*) very favorably, and decided to see them again next year; (*c*) is not suited for growing.

3. "King Cole." This apple was formerly known as Cole's Champion. It was reported as a good cropper, from the North-East of Victoria, and from Bairnsdale. Mr. Gray said that at Hurstbridge he had noticed a little woolly aphis on the tree. The committee decided not to recommend it for planting at present, but to see it again next year.

4. Ellison's Orange Apple, sent from Mount Barker, Western Australia. An English apple, evidently not suited to Australia. It is not recommended for planting.

5. Pickering Plum. A plum grown at Mitcham, Victoria, and raised by the late Mr. Pickering. It is a good keeper, and of fine flavour, very dark, and not quite so large as President. It was agreed to view it next year and compare it with President.

6. Seedling plum, grown by Mr. A. F. Thiele, Doncaster, Victoria, a chance seedling; recommended by the committee as a late plum; a good cropper, sweet and fine flavour; reported as the best plum of April-May. To be named.

The committee decided to again view the following fruits in 1924:—

Seedling pear, A. B. Robin, Nuriootpa, South Australia.
Seedling apple, J. Lang, Harcourt, Victoria.
Seedling pear, J. Lang, Harcourt, Victoria.
Seedling apple, "Milbert," New South Wales.
Seedling apple, No. 6, Mr. J. Bulman, Freshwater Point, Tasmania, a seedling from Worcester Pearmain.
Seedling apple, Mr. M. Yeoland, Littleton, Tasmania.
Seedling apple, No. 8, Mr. J. Bulman, Tasmania.
Seedling pear, C. H. Seelenmeyer, Harcourt.
Seedling peach, cling No. 2, Mr. A. F. Thiele, Doncaster.
Seedling pear, Mr. C. F. Cole, Wangaratta.
Seedling passion fruit, Mr. A. F. Thiele, Doncaster.
Seedling apple, Mr. A. F. Thiele, Doncaster.
Sport apple, Red Spy, Mr. Johnstone, Stanley, Victoria.
Seedling apple, J. Grunsell, New South Wales.
Lang's Best and Bess Pool apples, for comparison.

The committee decided that the following fruits were not superior to other varieties:—

Barossa apple, seedling No. 7.
Ferndale apple, Mr. J. Bulman, Tasmania.
Seedling pear from Bathurst Orchard, New South Wales.
Seedling peach, cling No. 1, A. F. Thiele, Doncaster.
Seedling apple, A.N. 47.
Seedling apple, Mr. H. J. Rumsey, Dundas, New South Wales.

TOMATO WILT.

Mr. Thomas presented a report on four varieties of American tomatoes which were distributed from the Department of Agriculture in Washington, United States of America. In Tasmania, Marvel and Norduke proved anything but wilt-resistant. None of the varieties this year proved good commercial types.

The Secretary reported that Mr. Brittlebank had again failed to isolate any organism causing spotted wilt. The Burnley experiments were being continued, and Mr. Rae, the Principal at Burnley, was carrying out breeding experiments, using the currant tomato, which is wilt-resistant, as the base of the experimental work.

Mr. Wicks reported that he had seen the currant tomato in abundance in the South Sea Islands last year, and it was never wilted, while other varieties were.

Mr. Quinn reported that the tomato wilt does not appear every year with the same virulence. He had grown twelve plants of twelve varieties, and from one to three plants of all varieties had been attacked. He had obtained fruits from five of the twelve varieties from diseased plants. Seeds were sown from fruit obtained from plants that had died from wilt. In 1921-22 the plants from these seeds were quite free from wilt. There were acres of tomatoes grown under glass in South Australia. Plants from the same seed-bed were grown outside as well as inside, and in the same soil with the same irrigation, and the glass-house-grown plants had never shown wilt. Mr. Quinn said he had seen a tomato plant, portion of which had grown through a broken pane, and the part of the plant that grew outside was badly wilted, while the parts inside were quite free. Wilt always appeared when there was a great drop in the temperature.

If the weather became warm and remained at an even temperature, the plants seemed to hold their own, but with a cold check another attack supervened. It would appear that the sudden drops and rises in temperature were more the cause of the wilt than anything else, and that the cause was probably physiological.

Mr. G. Peart saw the American tomatoes grown by Mr. Hutchinson, at Tatura, Victoria. Marvel did not look a good tomato, but none of the four took wilt this year. The varieties were Marvel, Norduke, Columbia and Norton. Early tomatoes, in his experience, take wilt, while late-planted ones rarely take it.

It was decided that all States make observations for next year.

ELIMINATION OF UNDESIRABLE VARIETIES FROM NURSERYMEN'S CATALOGUES.

The Secretary reported that the Australian nurserymen were unanimous in eliminating the names of undesirable types of fruit from their lists, and that some had already reduced their catalogues by a number of pages. The following motions were carried:—(*a*) That nurserymen be invited to indicate on their catalogues the varieties of fruit approved of by the Pomological Committee. (*b*) That each cannery and jam factory be written to, asking what fruit varieties they prefer for canning and jam-making; indicating peaches, pears, plums, and apricots. (*c*) That the matter of elimination of varieties be left to the nurserymen to deal with in conference. (*d*) That when making recommendation in catalogues, nurserymen urge intending planters to seek information locally before planting.

FRUIT FOR CANNING AND JAMS.

Messrs. Peart, manager Shepparton Cannery, Thompson, of H. Jones & Company, Hobart, Taylor, of the Australian Jam Company, and Carey, Commonwealth Inspector, were present.

Mr. Thompson reported that at Hobart no peaches were canned. The only two varieties of pears generally used for canning were Williams and Kieffer. Sometimes a few of the Napoleon (Vicar of Winkfield) variety were canned at the end of the season. This pear, however, was an unsatisfactory one to grow, as the fruit was inclined to drop from the tree, and consequently was often picked when too green. Further, it was somewhat hard for canning, and did not keep so well after canning as Williams.

Of apricots, Mr. Thompson said Moorpark was at a discount owing to Federal regulations. In addition, the fruit ripened unevenly. Oullins, he said, was not a prolific variety in Tasmania.

Blue Imperatrice was the only plum recommended in Tasmania for jam.

Mr. Taylor said that the Williams was the only pear suitable for canning. The flavour of Packham's Triumph was not good enough to make it a satisfactory fruit for canning, and he would not recommend Vicar of Winkfield. Only a few Kieffers, he said, were canned.

Mr. Taylor said the Moorpark apricot seemed to ripen unevenly everywhere, except at Geelong. Blenheim he described as the best canner for Victorian conditions. The Australian Jam Company had tried a few Tilton's—a late variety with a beautiful colour.

Mr. Wicks gave the order of ripening of apricots in South Australia as follows:—Newcastle (neither good for drying or canning), Oullins, Blenheim, Late Riverside, Californian Royal, Heemskirk, and Moorpark. Red Maskelyne was the earliest of all but it was rarely grown. The Royal must be short spur pruned to be productive.

Mr. Carey said he could not recommend Moorpark for canning. Peaches, he said, ripened in the following order:—Tuscan, Sims, Phillips, Goodman, Golden Queen, Pullar's Cling. In the Goulburn Valley, Goodman's Choice ripens about 25th February.

Mr. W. J. Allen reported the following dates of ripening of peaches: —Leader, 14th January; Levis, 16th January; Pelora, 20th January; Sims, 19th February; Phillips, 13th March; Golden Queen and Goodman's Choice, 15th March; sometimes Phillips ripens about 1st March.

Mr. G. Peart reported that Phillips Cling may be picked progressively for three weeks.

Mr. Quinn described the Royal apricot as a hardy variety, and even though the fruit fell from the tree it would not be injured. It was a more even ripener than Moorpark, though Moorpark was the better of the two for drying. Royals worked on peach stock at Blackwood were bearing up to ten bushels per tree.

Mr. Peart, manager of the Shepparton Canning Company, reported that while the Royal apricot was good for the Goulburn Valley, Shipley's and Tilton were the best. Kaisha had not yet been tried out. It was showing well, and yielded nice large fruit of even size, but the quality was not good.

Mr. Peart said that the Tuscan peach in the Goulburn Valley seemed inclined to develop into two kinds—one of them of very poor quality. Levis Cling had not yet been fully tested, but if it fulfilled its promise it would be largely used. Nichols Orange Cling “ragged freely, and consequently was not suitable for canning. Phillips, described as a beautiful peach and the best canner in 1923, was of good size and nicely coloured with red around the pit. Goodman's Choice, which ripens between 28th February and 1st March, was thought to be one of the best. He considered the days of Pullar's Cling were over. The stone in this fruit was too big, and was as big in a 2¼-inch peach as in one 3½ inches in diameter. Moreover, the fruit was too large. What was wanted for the English market was a peach that would go about ten halves to the can. Australia could not compete with California with a coarse peach like Pullar's. It started to ripen about 8th March, and this year lasted for five or six weeks, which was its only advantage.

Mr. Peart said he regarded Williams as the only pear suitable for canning. Packham's Triumph took too long to ripen, and ripened unevenly. After canning, the flesh turned mealy, and the syrup became thick and discoloured. Beurre Bosc came next to Williams, and Kieffer was not so good, while Vicar of Winkfield was not favoured.

A vote of thanks to the canning representatives, coupled with a suggestion that the Minister of Customs should make public the report of the Commonwealth Inspector of the fruit pack for 1923, was agreed to.

AUSTRALIAN BLUEBERRY.

For the protection of the grower and consumer, it was decided: "That it be recommended to the various State Departments to investigate the 'Australian Blueberry,' and other new fruits as advertised, with a vew to ascertaining the true nomenclature and breeding of these advertised novelties."

ABBREVIATION OF NAMES OF VARIETIES FOR BRANDING PURPOSES.

The meeting at Harcourt decided on the following abbreviations of the names of varieties of commercial fruits, for branding purposes, exported to either overseas or interstate markets:—

1923.

1. With short names, such as Fanny, Rymer, Dunns, Tasma, Yates, Howell, and others, it is optional to use either the abbreviations or the full name.
2. Initial letter of letters to be in capitals, other letters to be small
3. The stroke sign / denotes " of " or " de."
4. Apples to be branded in black, pears in red, or in white if jarrah cases are used.

APPLES.

Alfriston	A l f	Lord Suffield	L S d
Adam's Pearmain	A P m	London Pippin	L P n
Allington	A l n	Lord Wolseley	L W y
Alexander	A l x	McIntosh Red	McI R
Aromatic	A r o	Mobb's Codlin	Mob C
Bismarck	B m k	Nickajack	N j k
Ben Davis	B D s	Newtown Pippin	N P n
Buncombe	B c m	Perfection	P f n
Commerce	C o m	Prince Alfred	P A d
Crow's Egg	C E g	Ranelagh	R a n
Cleopatra	C l e o	Rienette de Canada	R/C
Cox's Orange Pippin	C.O.P.	Ribston Pippin	R P n
Crofton	C f n	Rokewood	R k d
Delicious	D e l	Rome Beauty	R B y
Dougherty	D h t y	Rymer	Rymer
Duke of Clarence	D/C	Spitzenberg	S p t z
Dunn's	Dunn's	Scarlet Pearmain	S P m
Dumelow (Wellington Pippin)	D m l	Sturmer Pippin	St P
Fameuse (Lady in Snow) (Pomme de Niege)	F a m	Scarlet Nonpareil	S N p
Fanny	F n y	Senator	S e n
Foster	F o s	Stone Pippin	Stone P
French Crab	F C b	Strawberry Pippin (Winter Strawberry)	Str Pn
Granny Smith	G r S	Statesman	S t m n
Gravenstein	G r a v	Stayman (Stayman Winesap)	Sty W
Hoover	H v r	Tasman's Pride	Tas P
Jonathan	J o n	Tasma	Tasma
King David	K D v	Worcester Pearmain	W P m
King of Pippins	K/P	Yates	Yates

PEARS.

Beurre Bosc	B Bosc	Gansel's Bergamot	Gan B
Beurre Clairgeau	B C g u	Giblin	G b n
Beurre de'Anjou	B/A	Glou Morceau	G l M
Beurre de'Capiaumont	B/Cap	Howell	H w l
Beurre Diel	B Diel	Josephine de Malines	Jos/M
Beurre Easter	B East	Keiffer	K f r
Beurre Hardy	B Hdy	Madame Cole	M Cole
Beurre Superfine	B Sfn	Marie Louise	M L
Black Achan	B Ach	Packham's Triumph	P k T
Broompark	B P k	Vicar of Winkfield (Napoleon)	V/W
Clapp's Favourite	Clp F		
Conference	Conf	Williams	W B C
Doyenne du Comice	D/C	Winter Cole	W Cole
Duchesse d'Angouleme	D/A	Winter Nelis	W Nelis

It was decided to endeavour to hold the next meeting in Hobart, Tasmania, about the last week in April, 1924.

THE VALUE OF FRUIT AS AN ARTICLE OF DIET.*

By Dr. J. H. L. Cumpston, Director-General of Health.

Before any estimate of the value of any particular article of food can be attempted, it is essential to obtain a clear idea of the reasons why food is necessary, of the requirements that a perfect article of food must satisfy, and of the way in which food becomes available for use by the body.

THE REASONS WHY FOOD IS NECESSARY.

Without discussing too fully the intricacies of the subject, it may be accepted that the discharge of all the functions of the body—the beating of the heart, the processes of thought, the contractions of muscles which cause movements, and so on—can only be accomplished by the expenditure of a certain amount of energy. This energy is provided by a corresponding actual loss of substance by the body tissues. Therefore to make good this loss of substance, which goes on incessantly from the moment of conception till the hour of death, and to thus maintain the body in normal working condition, fresh supplies of material must be forthcoming. The food we eat provides the supply. While this actual loss of substance must be made good, there is also during the earlier periods of life a constant growth of all parts of the body. So that the food must be supplied with the double object of replenishing the loss by "wear and tear," and also enabling the body to grow.

THE REQUIREMENTS THAT A PERFECT ARTICLE OF FOOD MUST SATISFY.

In the first place, as has just been said, the substance actually lost must be replaced. So that the first point to be considered is to ascertain quite clearly what substances are lost from the body as a result of the performance of its functions. This has been experimentally investigated, and is now quite decided. The avenues by which the loss occurs are the lungs, the skin, the kidneys, and—to a less extent—the bowels. Analysis of these waste products shows that they consist almost entirely of four chemical elements—carbon, hydrogen, oxygen, and nitrogen—and that the proportions of these various substances remain fairly constant. Therefore, the main problem to be solved is how to supply these four elements in the proper proportions.

Food in the forms in which it is universally taken may be classified under five definite heads, according to its composition. These groups are named as follow:—Proteids, carbohydrates, fats, salts, and water. Of these, water, a familiar enough substance, plays the most important part. The proteid group is the only one of these which contains the necessary nitrogen, and may be represented by the white of an egg, which is the purest form of proteid among the common articles of diet. The lean part of meat is another example of a proteid form of food. The term "fats" sufficiently explains itself—butter and the fat of meat are common examples. Carbohydrates are a group of substances all alike in chemical composition, but somewhat unlike in the forms in which they are familiar to us. Potatoes, flour, and sugar are all examples of the carbohydrate type of food. Salts form a small portion of food; there are a large number of them, and the most familiar example is ordinary table salt.

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* Reprinted with some slight amendment from the *Journal of Agriculture* for April, 1913.

So that, in an ordinary breakfast, the chop is the proteid, the bread and the sugar in the jam are carbohydrates, the butter is the fat, the salt is used with the chop, and the water is provided by the tea.

As proteids are the only food substances which contain nitrogen, it is obvious that life could not be maintained unless proteids are taken. Proteids, however, contain less carbon than nitrogen, so that if proteids alone were eaten in order to obtain the necessary amount of carbon, far too much nitrogen would be taken. A mixed diet is therefore absolutely necessary, and for other reasons a mixed diet, such as is usually taken, containing all five groups of substances, has been shown to be the most satisfactory. Science has thus been able to prove in this century that mankind has been eating the proper kinds of food since the beginning of time.

THE WAYS IN WHICH FOOD BECOMES AVAILABLE FOR USE BY THE BODY.

For the food substances to be of any use to the body tissues, to the muscles for example, it must be carried to the muscles by the blood. To get into the blood, it must pass through the walls of the intestines in a liquid or dissolved form. Obviously, in the form in which food is taken into the mouth, it would be absolutely impossible for it to pass through the walls of the intestines. Therefore, the digestive apparatus has been provided. The teeth break up the food into small particles; then the digestive juices in the mouth, stomach, and intestines mix with the food and chemically change it, dissolving it and ultimately coverting it in such a way that it can pass through into the blood and be at once available for use by the tissues. It has been long understood that unless each minutest part of the food is reached and acted upon by the digestive juices the process of digestion will not be complete.

Having then considered food in general, it becomes possible now to discuss fruit in particular, and to attempt to estimate the value of this class of foodstuff. In the first place, are the different groups of food substances which have been shown to be necessary contained in fruits, and if so in what proportions are they present? Considering the commoner varieties of fruits—apples, pears, plums, peaches, apricots, cherries, grapes, gooseberries, currants, &c.—it is found that these contain about 85 per cent. of water, a very low proportion of proteids, a moderate amount of carbohydrates, and in addition to these a considerable proportion of vegetable acids and of salts. They contain no fats. The fact that fruits contain a low proportion of proteids at once makes it clear that the fruit would not be sufficient by itself to carry on the work of the body; but as fruit contains carbohydrates, salts, and a large amount of water, it takes its place as a possible constituent in a mixed diet. The fact that the carbohydrates and salts are, to a large extent, contained in the water, *i.e.*, as juice, and are thus present in a readily available form, greatly adds to the value of this form of diet. In short it is evident that fruit by itself is insufficient to maintain life for any prolonged period, that it takes its place along with an infinite variety of other foods as a pleasant and palatable form in which some of the necessary food substances may be taken; but that, unless it can be shown that fruit has in itself a special quality which is not possessed by other foods, then it must be considered that fruit is not an indispensable article of diet.

HAS FRUIT SUCH A QUALITY?

Let me remind you of what is a familiar fact—that outbreaks of scurvy on shipboard very rarely occur when the ship is provided with a sufficient supply of fresh limejuice. Without entering at any length into the theory of the question, it may be said that scurvy, and some other diseases, are almost certainly due to the absence from the diet of certain vital constituents of fruit and vegetables, and that, if the body be deprived for any prolonged period of these vital food factors, then a definite derangement of health, such as scurvy, rickets, or beri-beri, will accrue, and the fact may be accepted that the absence of fresh fruit or fresh fruit juices from the diet may lead to considerable derangement of health.

In another direction fruit plays a very useful part. If a small piece of meat is placed in the juice of a fresh pineapple, the meat will gradually disappear—it is digested by a special constituent of pineapple juice. This special principle is called a ferment. Such ferments are present in all fresh fruits, and play a very considerable part in maintaining normal health. In still a third direction fruit has a special value. The cells of all varieties of fruit are encased in a fine envelope of woody fibre, known as cellulose. This is indigestible, and without producing the abnormal condition known as indigestion, it stimulates the walls of the intestines, increasing their activity, and so preventing constipation. This tendency is assisted by the large proportion of salts present in the juices, so that fruit is especially valuable in preventing constipation and assisting normal and regular digestion.

There is no doubt then that fruit has a special value as an article of diet, and is therefore practically indispensable. Particularly is this true in tropical and semi-tropical countries. The conditions of life in these countries are such that fruit is of almost inestimable value in the preservation of health. Different climates demand different diets. The Esquimaux find it necessary to consume enormous quantities of meat, and practically no other kinds of food. From this extreme, gradations are observed, until the races in tropical countries live almost entirely on fruit and grain, and have a minimum of flesh foods. In these States the climate is tropical and semi-tropical, and temperate, and it should be emphasized that here the more fruit a man eats the better will his health be.

A word as to the effect of cooking on fruits. In cooking, the cellulose walls of the cells are ruptured and the cell contents escape, so that it is more easy for the digestive juices to mix with cooked fruit than with raw, and therefore digestion is easier. On the other hand, most of the valuable constituents of fruit are present in the juice, and this becomes largely available during mastication, so that the necessity for perfect digestion is not so great as with some other foods. Further, the effect of cooking is to destroy the ferments, and so one of the most valuable constituents of fruit is lost. Therefore, while cooked and preserved fruits are good, raw fruit is probably a great deal better.

To sum up the position, then: Fruit contains some of the necessary constituents of all foods, and is therefore and by reason of its palatability, of general value; it contains certain special principles which are necessary to the body, and is therefore indispensable; it is of greater value in the raw than in the cooked state; it is of especial value in tropical and sub-tropical countries.

In view of these facts, it is obvious that an abundant supply of fresh fruit, sold at such prices as to be available to all, is an absolute necessity in a place with a climate such as we have.

While the reasons for it may be open to discussion, yet this fact is undeniable, that the price of fruit is maintained at such a level as to place it beyond the reach of those to whom an abundant supply would be most valuable. If it be that the fruit market is being financially exploited by the few to the detriment of the many, then these few should be forcibly reminded that financial exploitation of goods is less defensible when it controls foodstuffs needed by the people than in any other field of operations, and must inevitably bring about its own adjustment. Whatever be the direction in which the reform is called for, it is to be hoped that before long such steps will have been taken that the general public will have been provided with a sufficient supply of wholesome fresh fruit at a reasonable price.

THE COMPOSITION OF FRUITS.

The following analyses of some of the commoner fruits are taken from a work, *Food Inspection and Analysis*, by A. E. Leach, S.B., of the United States Department of Agriculture.

The analysis in each case is that for the edible portion of the fruit.

Fruit	Water	Protein.	Fat.	Total. Carbo-hydrates	Crude Fibre.	Ash	Fuel Value per Pound Calories.
Apples ..	84·6	0·4	0·5	14·2	1·2	0·3	290
Apricots ..	85·0	1·1	..	13·4	..	0·5	270
Cherries ..	80·9	1·0	0·8	16·7	0·2	0·6	365
Grapes ..	77·4	1·3	1·6	19·2	4·3	0·5	450
Lemons ..	89·3	1·0	0·7	8·5	1·1	0·5	205
Oranges ..	86·9	0·8	0·2	11·6	..	0·5	240
Pears ..	84·4	0·6	0·5	14·1	2·7	0·4	295
Pineapples ..	89·3	0·4	0·3	9·7	0·4	0·3	200
Plums ..	78·4	1·0	..	20·1	..	0·5	395

OIDIUM OF THE VINE.

Uncinula Spiralis (Berkeley & Cooke).

By F. de Castella, Government Viticulturist, and C. C. Brittlebank, Government Pathologist.

Of all fungous diseases which attack the vine, Oidium, or Powdery Mildew, as it is called in America, is the most familiar. Fortunately, it is also the easiest to control; unlike other vine fungi, it yields to curative treatment such as would be hopelessly ineffective in the case of Downy Mildew or Black Spot.

Its virulence can, nevertheless, be very great in the absence of treatment and under climatic conditions which suit it. Shortly after its first appearance in France, and before the discovery of sulphur as a specific for its control, it constituted a disaster of the first magnitude, frequently entailing the loss of the greater part of the grape crop.

In Australia, especially in the warm inland districts, thanks to our drier atmosphere, it is seldom capable of such havoc. In some localities and seasons, however, it may cause serious loss, and information concerning its life history and methods of treatment will be found useful.

Historical.

Unlike Black Spot, which has been known in European vineyards since remote antiquity, Oidium is a comparative new comer. It was unwittingly imported into Europe from North America, where it is indigenous. It was first noted in England by Tucker, on vines grown under glass at Margate, near London, in 1845. It was not found in France until 1847, when it appeared, also on vines under glass, on M. J. de Rothschild's property at Suresnes, near Paris. The following year it was found on all vines under glass in Northern France, and occasionally in neighbouring vineyards. In 1850 it seems to have made its first appearance in the south of France (Lunel) and near Bordeaux, as well as at a few points in Spain and Italy. By 1851 all vineyards in France were invaded, as well as those of such Mediterranean countries as Spain, Italy, Greece, Syria, Asia Minor, Algeria, and Hungary. Damage was only severe in a few localities. In 1852 and 1853 disastrous outbreaks occurred in several southern French vineyards and at Bordeaux. In 1854 the ravages of the disease were such as to cause a panic among vine-growers. Sulphuring, which was first applied in England in 1846, came into general use. The new disease was mastered, and soon ceased to be feared by careful growers.

In the rapidity of its spread, Oidium much resembles Downy Mildew. The date of its first appearance in Australia is not easy to fix, but Oidium has been known in every district where vines are grown for very many years past. It is worthy of note that this disease seems to be now much less prevalent in Victoria than it was a couple of decades ago. Sulphuring, which was generally practised then, is now often dispensed with in the Murray Valley, without serious damage resulting. The reason for this decrease in severity is not very apparent. It is, no doubt, due to some change in our climate, resulting in reduced humidity in the atmosphere.

Conditions Favorable to Oidium.

Like all fungi, Oidium needs both heat and moisture for its development. It is less exacting than Downy Mildew as regards the former, being able to develop in sheltered situations at temperatures of from 50 deg. to 54 deg. F. It is thus able to make its appearance very early in the season, soon after the first sprouting of the vines.

The miniumum temperature needed for its development seems to be between 41 deg. and 50 deg. F., and the optimum, between 77 deg. and 86.* Marès found its growth to slacken down very much at 95 deg., becoming almost stationary up to 104 deg., at which temperature it is destroyed.

Moisture is needed in the form of atmospheric humidity, and not as rain or dewdrops, so indispensible for the infection of the vine by Downy Mildew and Black Spot; without raindrops there can be no spore germination of these fungi. The Oidium spore, on the contrary, can germinate in moist air, it does not need the drop of water.

Sultry conditions favour Oidium. Dull, cloudy weather, which is at the same time warm, is ideal for its spread. Hot, dry years, provided the atmosphere be humid or muggy, are favorable to the development of Powdery Mildew and wet years to that of Downy Mildew.

Severe Oidium outbreaks may occur without any rain at all. Heavy rain, especially if cold, may even hinder the disease, by washing off a good many spores. The moist, steamy conditions which follow the downpour permit the disease to resume its virulence unless checked by sulphur.

Opposite conditions, such as bright sunny days with crisp dry air, are altogether unsuitable for Oidium.

According to Viala, "warmth is the preponderant factor; thus, on dry, hill sides which quickly become warm, and on shallow, red, stony and sandy soils, where growth starts early, Oidium does much more damage than on flat land which is moist and cold.† On the banks of rivers and near the sea-shore, under the influence of fogs and mists on damp flat land, the disease only becomes serious when the temperature is fairly warm.

The presence of weeds and cover crops, as well as freshly-worked land, render the supernatant air more moist; they therefore favour this as well as other fungi.

Irrigation intensifies the prevalence of Oidium. This influence is more particularly noticeable in large irrigation settlements where a considerable extent of country is regularly watered. It is only in such, that any notable increase in atmospheric humidity could be expected.

Vines trained on high trellises and against walls are more severely attacked than those trained nearer to the ground and grown in the open. The proximity of large trees, which reduces liability to Downy Mildew, has a contrary influence so far as Oidium is concerned.

The liability of localities with a humid atmosphere, was strongly exemplified in Madeira. Shortly after its first appearance in the island it seemed as though vine culture were doomed. Many vineyards were eradicated, so hopeless did control appear before the discovery of sulphur as a specific. The disaster of 1851 at Madeira is often quoted as an example of what this fungus is capable of.

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* Viala, Les Maladies de la Vigne.

† It is no doubt for this reason that Oidium is usually found on the east side of the vines in a vineyard, *i.e.*, the side exposed to the rising sun—a fact well known to older vignerons.

Influence of Variety.

This is very considerable, some sorts are extremely liable, whilst others show a marked degree of resistance. One of the most susceptible varieties is Verdeilho. In vineyards where this vine is grown it is well to keep a watch on it for the first symptoms of the disease. The drying grapes—Sultana, Zante Currant, and Gordo Blanco—are very liable to Oidium, as are also most table grapes. Ohanez is very badly attacked.

Viala lists the following sorts as being very liable to Oidium:—

Muscats in general, Chasselas, Black Hamburg, Malvoisies, Teinturier, Folle Blanche, Clairettes, Picpoul, Gamay, Cabernet, Brun-Fourca, Syra or Shiraz, Roussanne, Riesling, Carignane, Pascal Noir, Sicilien, Ugni blanc (wrongly called White Hermitage here), Tibouren, Terret, Œillade, and Cinsaut.

And as less liable:—

Aramon, Sauvignon (white), Marsanne, Dolceto, Colombaud, Grenache, Espar (Mataro), Morrastel, Petit Bouschet, Bourboulenque, and Pinots.

Very seldom attacked are:—

Cot (Malbeck), Melon, Calitor, and several Vinifera x American hybrids.

Resistant stocks, in fact American species in a general way, suffer much less than Vinifera varieties. It was this resistance to Oidium of Isabella (a Labrusca x Vinifera hybrid) which led to its extensive planting in Italy shortly after the first appearance of Oidium in that country.

Professor Bioletti mentions several of the above-named susceptible sorts with the additions of Flame Tokay. He lists, as being more resistant, the following:—Beclan, Duriff, Alicante Bouschet, and Vernaccia.

Outward Appearance.

The outward appearance of Oidium is so well known and so characteristic as to scarcely need detailed description. All green, growing parts of the vine are liable to attack—leaves, canes, embryo bunches, tendrils, &c.—on these it manifests itself as a very fine dusty film which gradually becomes greyish and presents a typical faint mouldy smell. (See Fig. 1.) The American common name of Powdery Mildew describes it very aptly, and at once distinguishes it from Downy Mildew. There is no possibility of confusion between the two. The patches of the latter fungus consist of a white and glistening "down" on the leaves, they only appear on the under side, and are altogether distinct from the usually slight, diffuse, dusty film of Oidium which is most noticeable on the glossy upper side though it is present below also. In severe cases the Oidium patches may become fairly thick; they are then greyish in appearance, and quite different from the glistening white down of the other mildew. (See Fig. 1.) The Oidium patches gradually assume a darker appearance, and if rubbed off with the finger this will be seen to be due to black markings of the outer skin, the surface cells of which have been injured by the fungus. This is particularly noticeable after the fungus has been killed by sulphur. The somewhat blackened appearance of the vines a day or two after sulphuring is welcomed by practical vignerons, who take it as an indication that the treatment has effectually killed the fungus. These black markings may rather spoil the appearance of table grapes. On the canes they may be branched and fern like, or merely mottled. The markings thus left on the ripened canes in winter are sometimes mistaken for Anthracnose (Black Spot) scars. There is a great difference between the two, however, Anthracnose scars are sunken in the depressed centre being usually surrounded

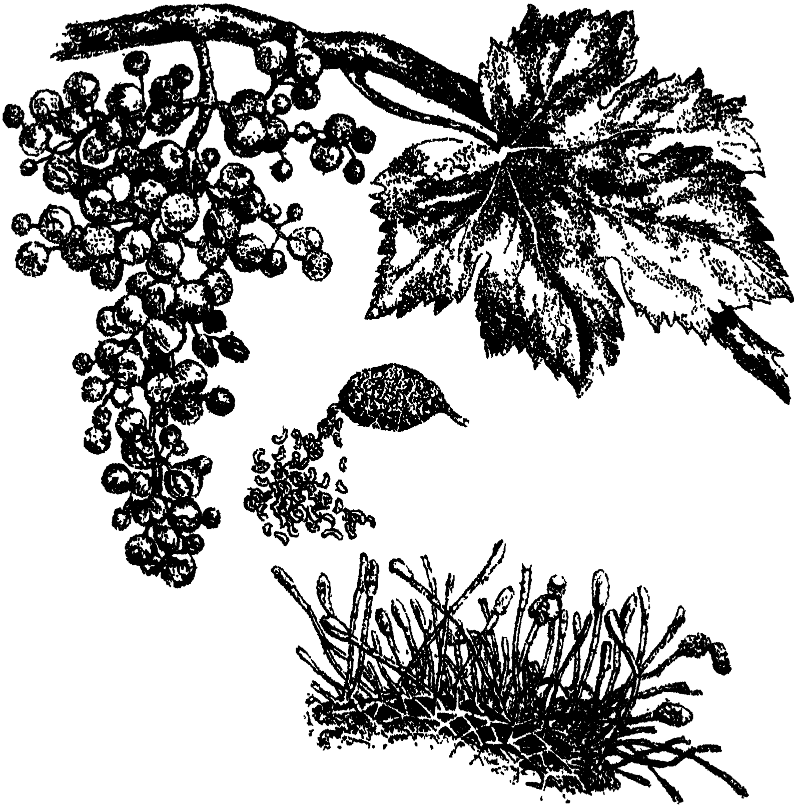

Fig. 1.—Oidium or Powdery Mildew of the Vine.

UPPER PART.—Usual appearance of attacked vine. The grey powdery or mealy appearance is difficult to represent graphically. The immature berries are splitting as a result of fungus injury.

LOWER PORTION.—A speck of infected surface on a berry highly magnified. The net-work, or felt, of Mycelium, creeping over the surface sends up more or less erect conidiophores, which bear the conidia or summer spores

MIDDLE PORTION.—Spore-bearing body (pycnidium) of *cicinnobolus cesatii*, a parasite fungus sometimes found on Oidium.

by a more or less swollen rim. The markings left by Oidium are discoloured, sometimes even rough, with minute black prominent specks all over them, but the surface is always flush; there is no central depression. (See Fig. 2.) If the canes are quite young when attacked, or in the shoot stage, they may dry up altogether; later on they may fail to ripen properly, being thus rendered useless as pruning wood.

Young leaves severely attacked cease growing, and are deformed; these and also adult leaves are rendered incapable of functioning properly; they become brittle and fall easily; they are often discoloured, and appear as though covered with a sticky black dust.

Though severe loss may result from damage to canes and foliage, it is the fruit which is most vulnerable. Oidium may attack the vine at any period during the growing season. It is most frequently observed just before the fruit ripens, but the gravest damage results about or shortly after blossom time. Embryo bunches attacked before the flowers open, dry up and fall off. Shortly after setting, similar damage may result, whilst later on when the berries are about half grown, the hardening of the skin preventing normal increase in size, the berries split, exposing the pips (see Figs. 1 and 3) and allowing rain to enter, thus rendering the grapes mouldy and valueless. Even if not injured to this extent, Oidium on the grapes at vintage is most undesirable. Table and drying sorts suffer much in appearance, whilst wine made from affected grapes is faulty in composition, and therefore liable to secondary fermentations. It also usually presents a characteristic "Oidium taste," being bitter and unpleasant.

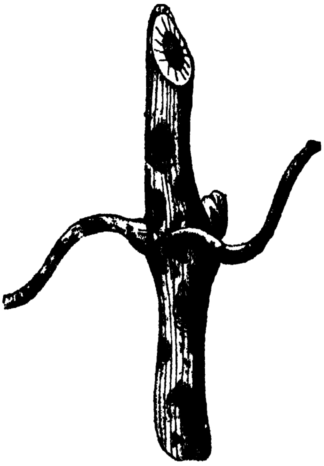

Fig. 2.—Blackened and mottled appearance of ripe vine canes caused by Oidium.

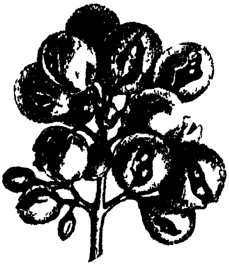

Fig. 3.—Immature berries which have split before ripening owing to hardening of the skin caused by Oidium.

Vines severely attacked ripen their wood badly, and fail to accumulate the normal reserves for next season's growth. Oidium can thus severely reduce the crop of the season following that in which the outbreak took place. It is rare, however, for vines to succumb altogether.

Life History*.

The fungus which causes Oidium and which is now known botanically as *Uncinula spiralis*, was called Oidium Tuckeri when first found near London in 1845. It was long known by this name, which was subsequently changed to Erysyphe Tuckeri, which finally gave place to its present name, when the complete or *perithecial* form was found in France in 1892.

Uncinula spiralis belongs to the great fungus group of Ascomycetes; sub-group Pyrenomycetes; order Perisporiaceæ; family Erysypheæ.

The Uncinula fungus differs radically from those causing other vine diseases, in that its mycelium† is epiphytic, *i.e.*, external to the tissues of the vine. It never enters these, but runs along the surface, sending suckers or *haustoria* through the outer skin to obtain its nourishment. This external nature of the mycelium is a very important feature, since it renders the disease amenable to curative treatment. Downy Mildew and Black Spot are absolutely different; their mycelia being endophytic or internal, control must necessarily be preventive. Once the fungus has obtained a footing in the tissues of the host plant it is hopelessly beyond the reach of any fungicide. The external mycelium of Oidium, on the contrary, is quite exposed, and easily reached by fungicide applications. Other well-known fungi belonging to the same orders are the powdery mildew of the rose (*Sphærotheca pannosa*); of the apple (*Bodosphæra tridactyla*), and of the cherry (*P. oxycanthæ*). Like uncinula, these are also epiphytic fungi. Though similar in outward appearance and mode of life, they are nevertheless quite distinct

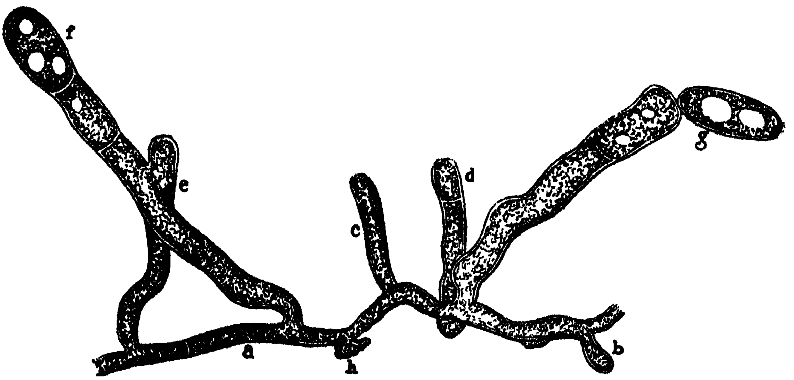

Fig. 4.—Fragment of Mycelium of *Uncinula spiralis.*

(*a*) with *haustorium* or suckers; (*h*) are *conidiophores* in various stages of development; (*b*), (*c*) and (*e*) are quite immature; (*g*) is ripe and its terminal part is breaking off in the shape of a conidium or summer spore; (*d*) and (*f*) show intermediate degrees of ripeness. After Viala.

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* *See* Viala, Les Maladies de la Vigne, also Bioletti, Oidium or Powdery Mildew of the Vine. Bulletin No. 1861 (Feb., 1907), University of California publications.

† Fungi consists of two essential parts *i.e.*, Mycelium, the growing or vegetative part and the spore bearing or reproductive portion, very variable in form. Mycelium is defined by de Bary as follows:—"Vegetative portion of thallus of fungi, composed of one or more hyphæ. The Mycelium is the feeding portion, and therefore, in the case of parasitic fungi, the harmful portion. In edible cultivated mushrooms it is popularly known as spawn."

from vine Oidium. Each needs its own particular host plant and is incapable of living on the vine.

Fig. 4 shows the different parts of the fungus in its active growing state. The roughly horizontal portion (*a*) is the mycelium, the branches growing off it (*b, c, d, e, f*, and *g*) are spore-bearing filaments or *conidiophores* in different stages of ripeness; (*h*) is a sucker or *haustorium*. (See also Fig. 1, lower part.)

The mycelium is very slender, there is but little variation in the diameter of its strands, which is barely two ten-thousandths of an inch (Omm. .0045). It is a good deal branched; from two to five strands starting from the same point. These cross one another, and seem to be knitted together at the points of contact. In bad attacks an almost felt-like network may be thus formed (see Fig. 1). The haustoria (see Fig, 4*h*) occur at intervals on the lower side; they serve the dual purpose of feeding and supporting the mycelium. They cause the minute black specks left by Oidium after its destruction (see p.).

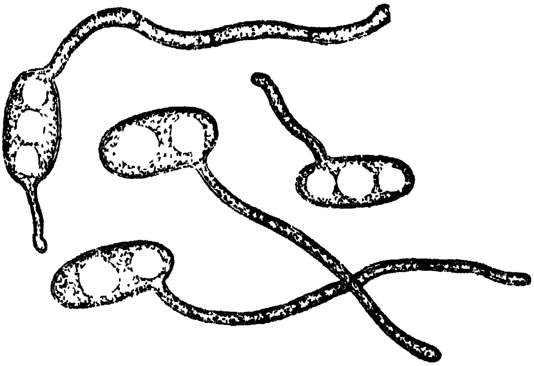

Fig. 5.—Germinating Conidia of *Uncinula spiralis.*
Magnified 500 times. After Viala.

Unlike Plasmopara (Downy Mildew), the mycelial strands of Uncinula are septate; the septa occur at fairly long intervals, and are rather difficult to observe.

Conidiophores bearing conidia or summer spores are thrown up from the mycelium. They are very abundant on attacked berries, to which they give the characteristic white appearance. Spore production is very simple; when the conidiophore has reached its full length, septa appear in it, thus progressively detaching fragments which break off as conidia. Three or four of these are usually formed on a single conidiophore (see Fig. 4).

The conidia are about six ten-thousandths of an inch long (Omm. .016). They are extremely light, and can be carried long distances by a gentle breeze; Uncinula thus spreads with similar facility to Plasmopara (Downy Mildew). They resist dry conditions very much better than Downy Mildew spores; awaiting favorable conditions for germination. If wetted, conidia, as well as mycelium, adhere strongly, without being damaged, to the surface which supports them.

Conidia germinate by the simple emission of a germ tube (Fig. 5), which is, in fact, a mycelial strand infecting vine tissues in its turn. It is important to remember that, unlike Plasmopara and Manginia, the conidia of Oidium do not need a drop of water for their germination—humid air suffices. It can be easily observed by placing berries attacked by Oidium under a bell glass at a temperature of 77 deg. to 86 deg. F.

Wintering Forms.

The form described above (conidial form) is that in which the fungus passes spring, summer, and early autumn—its period of active life. When it completes its life cycle it passes the winter in another form, viz., as *ascospores* contained in a *peritherium*.

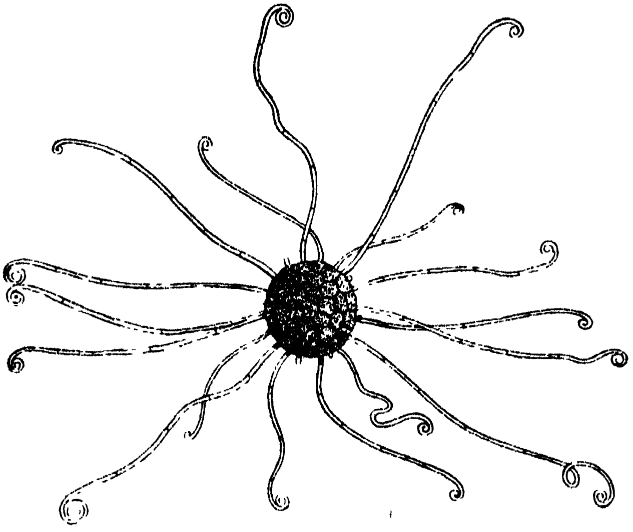

Fig. 6.—Perithecium of *Uncinula spiralis*, seen from above.
Magnified 100 times. After W. G. Smith.

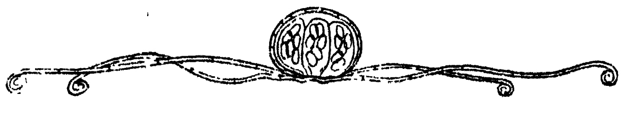

Fig. 7.—Diagram showing section of Fig. 6. Ascospores contained in Asci.
After W. G. Smith.

In late autumn or early winter there appear among the mycelial strands numerous round, somewhat flattened, black or dark-brown bodies; these are perithecia. They are about 1/250 of an inch in diameter, and therefore visible to the naked eye. To borrow Bioletti's ingenious illustration, they are about half the diameter of the dot of an "i" of the type in which this article is printed. They are attached to the vine surface by from ten to twenty-five hair-like appendages coiled into a spiral at the free end; hence the specific name of the fungus. They consist usually of a single thread, but are occasionally branched.

A perithecium (see Figs. 6 and 7) consists of a very resilient outer covering or rind enclosing 4 to 8—usually 6—asci. Each ascus is a sort of small sac containing in its turn, the spores to the number of 4 to 8—6 is the usual number.

These spores, or more correctly sporidia, are known as *ascospores* or *thecaspores;* by their germination the annual life cycle of the fungus is started.

In spring, under the influence of warmth and moisture, the perithecia swell and burst (see Fig. 8) (the arci burst likewise), setting free the ascospores; by their germination, which takes place in the same way as that of the ordinary summer spores, the first Oidium outbreak of the season is started. Ascospores have been found experimentally to retain their vitality and capability for germination for at least eighteen months after their formation.

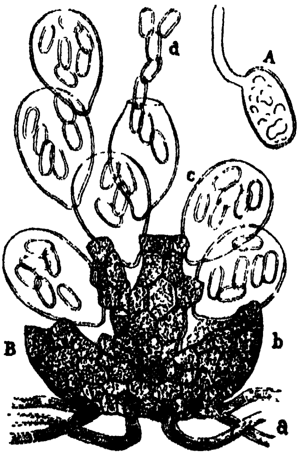

Fig. 8.—Perithecium of *Uncinula spiralis* bursting in Spring and liberating the spores; at (a) germinating ascospore.

In many cases the life cycle of *Uncinula spiralis* is incomplete, the perithecium stage being lacking. It has not been observed in Australia, nor was it known in France until 1892. Prior to that date American Oidium was generally considered to be distinct from that which occurred in European vineyards. The only difference was the absence of perithecia in the latter case; the discovery of these bodies in France dispelled all earlier doubt as to the identity of the two.

> "It seems probable that the fungus, under some conditions, can pass the winter in the conidial or summer form. At all events, in certain districts the perithecia have never been found, and are, therefore, absent or very rare. They are very rare in the interior valleys of California. On the other hand, they are produced in immense numbers on vines within the influence of the summer ocean fogs. At Berkeley it is common to find thousands of them on every leaf and cane of a vine. More than 100,000 perithecia have been counted on the upper surface of a single leaf, and as each perithecium contains fifty or more spores, the number produced on a single vine may be hundreds of millions.
>
> In Europe they are formed in September and October. In Berkeley they are found in abundance as early as the middle of June. Their formation seems to depend on weather conditions. If after a period of warm, moist weather, which has produced an abundant growth of mycelium, the temperature suddenly falls

to near the lowest limit for the growth of the fungus (50 deg. F.), they are produced rapidly and in great numbers. These are weather conditions which often occur at Berkeley and in the valleys nearest the coast.

In the interior very different conditions exist. The fungus may grow abundantly during the spring and early summer, but there is seldom any fall of temperature at this season sufficient to cause the production of winter spores. As the summer advances, the air becomes too hot and dry for the fungus, so that by the time the cooler weather of October arrives, most of the Oidium has disappeared and the abundant growth of strong mycelium which is necessary does not exist."*

In the absence of perithecia, how does the fungus over-winter? A definite answer cannot be given. Authorities are not in agreement on the subject. Professor Ravaz is of opinion that[1] it is by means of

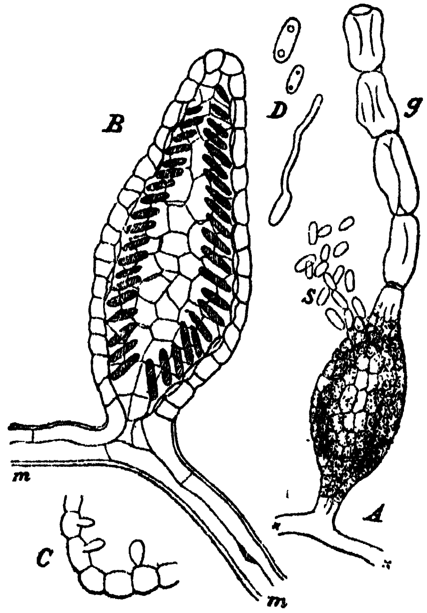

Fig. 9.—Spore-bearing bodies (pycnidia) of cicinnobolus cesatii, a fungus parasite on Oidium.

(*A*) A ripe pycnidium, formed on a conidiophore of *Uncinula spiralis* discharging its spores. (*s*), (*g*) Dead conidia of uncinula. (*B*) Immature pycnidium, showing spore formation. (*A*) Magnified 380, (*B*) 600 times.

hibernating mycelium in the dormant buds of the vine. Here it is well protected by the scales of the buds, the cottony nature of which makes them quite impenetrable by any fungicide, the use of which might be attempted.

An Oidium Parasite.

Curious spore-containing bodies have often been found on the mycelium of Oidium on badly-affected berries (see Fig. 9). These were at one time looked upon as pycnidia of the Oidium fungus. de Bary showed them to be the spore-bearing apparatus of quite a different fungus which he named *Cicinnobolus cesatii*, which lives as a parasite on Oidium. It has been suggested that artificial cultures of this organism might be used for Oidium control.* Nothing of a practical nature has been achieved in this direction.

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[1] Bioletti; *ibid.*

Treatment.

Winter treatment of Oidium is quite useless. The perithecia buried in the soil are as securely protected as the oospores of Downy Mildew. Nor is the hibernating mycelium in the vine buds more accessible. Owing to their cottony nature it is not possible to reach it with fungicide solutions.

During the growing period of the vine, on the other hand, control is not only possible, but fairly easy, being greatly facilitated by the external nature of the mycelium already referred to; this even renders possible curative treatment which would be quite futile in the case of fungi with internal mycelia. Dusting with dry sulphur in powder has long been the standard treatment of Oidium. So long as the weather is warm enough for the sulphur to give off the emanations to which it owes its action excellent results can be relied on. In cooler weather sulphur is less certain and liquid sprays of various kinds can be with advantage substituted for it, chief amongst these are weak solutions of potassium permanganate and of alkaline sulphides.

SULPHUR.

It is strange that this substance which is still the standard specific, should have been hit upon almost as soon as Oidium made its appearance in Europe. Dusting with dry sulphur seems to have been first proposed by Kyle, an English gardener, in 1846. Tucker seems to have recommended its application, mixed with lime, about the same time. Berkeley described the results obtained in the *Gardeners Chronicle*, in 1848.

From England the use of sulphur spread to France, where it was already in general use in the early fifties. The now familiar sulphur bellows seems to have first been invented by Gonthier, a French gardener, near Paris, in 1850.

In the earlier days of its use, sulphur did not give the uniform good results which can now be expected from it. Much had to be learnt concerning its judicious use, especially as regards the proper timing of sulphurings. One of the earliest and certainly most complete memoirs on Oidium and its treatment was that published by H. Marès, of Montpellier, France, in 1856. This remarkable work, together with later contributions by the same authority, constitute the basis of our present knowledge on sulphuring for the control of Oidium.

HOW SULPHUR ACTS.

The exact mechanism by which dry sulphur applications exercise their well-known destructive action on the Oidium fungus has given rise to much discussion. Older authorities are agreed that it is due to emanations which are produced when the sulphur is at a temperature of 77 deg. F. and over. Whether these emanations are sulphurous acid, sulphides, or merely sulphur vapour seemed uncertain. Direct contact was also held to exercise an action. According to Young, these emanations consist of pentathionic acid, an oxidation compound formed from sulphur and water.* It is evident that the emanations are more plentiful in close proximity to the particles; hence the smaller these are, so as to multiply the sources of the emanations, and the more evenly they are distributed the greater the efficiency of the treatment. Fineness also ensures better adherence to the surface of the vine. Fineness of the sulphur particles is really of far greater importance than the purity of the sulphur. The question of the fineness of the sulphur powder, and how it can be measured, will be dealt with later.

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* Pacottet—*Viticulture*, 1st edition, p. 362.

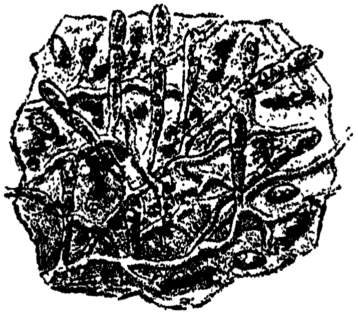

Fig. 10.—A speck of the affected skin of a grape immediately after sulphuring. The black specks represent sulphur.

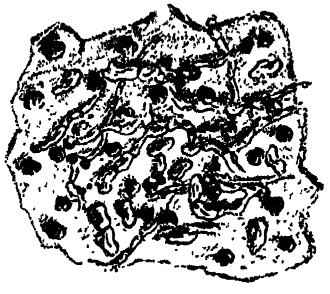

Fig. 11.—A speck of the affected skin of a grape a few days after sulphuring. The Mycelium and Conidiophores are faded and killed. The black specks represent sulphur.

Shortly after an application of sulphur, provided the weather be sufficiently warm for its action to be satisfactory, a marked change is noticeable in the appearance of the fungus (see Figs. 10 and 11), which fades, and becomes wrinkled, dying soon after.

When to Sulphur.

The right time for sulphuring, and the number of applications needed, necessarily depend on the district, and the prevalence of Oidium due to various causes. The susceptibility of the vine varieties grown, and the peculiarities of the season, must be borne in mind.

Though capable of curative treatment, as has been shown above, early treatment, before the fungus has firmly established itself on the vines, is most desirable. Prevention is always better than cure, even in the case of a disease which is capable of cure.

The fundamental rule for sulphuring laid down by Marès many years ago was to "spread the sulphur dust on all the green parts (of the vines) from the first symptoms of the disease, and renew the application each time it re-appears on the vine; further, give a sulphuring at the time of the blossoming."

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* The Toxic Property of Sulphur.—Harry Curtis Young. (*Annals Missouri Botanic Gardens.* Vol. IX, No. 4, 1922.)

Conclusions.

7. The toxic property of sulphur is not due to SO_2, SO_3, or H_2S, or any of the common acids or oxides of sulphur, or to the sulphur particle. Germ tubes grow normally in a heavy suspension of precipitated sulphur in closed ring cells.

8 The toxic property of sulphur is only exhibited when oxygen and water are present.

9. By chemical analysis the toxic property of sulphur has been found to be pentathionic acid, which is an oxidation compound formed from sulphur and water.

10. Pentathionic acid is volatile and is an active absorption compound. It is destroyed in acid and alkaline solutions.

11. Finely divided sulphur is more readily oxidized to pentathionic acid at ordinary temperatures than are the flowers of sulphur.

Sulphuring when the vines are in flower has a decidedly beneficial effect on the setting of the fruit.

In the majority of cases a first sulphuring, when the vines are in blossom, followed by others should the fungus make its appearance, will enable the disease to be controlled.

In localities and with varieties very prone to Oidium, it is always well to give a preliminary preventive sulphuring when the young shoots of the vine are about 8 inches to a foot in length.

Under Australian conditions scalding of fruit and foliage is apt to occur should sulphuring be immediately followed by an exceedingly hot sun. It is therefore well to avoid sulphuring in such weather. Treatment under such circumstances is in any case unnecessary, the high temperature alone is capable of destroying the Oidium.

It is also well for this reason, not to follow the old-fashioned practice of only sulphuring in the very early morning "when the dew is on." It is now recognised that sulphuring at any time of the day is equally effectual, and some hours after sunrise one is better able to judge the probable maximum temperature.

In cases where scalding is feared, it is sometimes recommended to spread the sulphur on the soil, or on the crown of the vine. Applied thus it is quite efficacious, provided the day temperature rises sufficiently high, but under such conditions sulphuring should be scarcely necessary, the high temperature alone should be capable of dealing with the fungus unaided by sulphur.

(*To be continued.*)

ONE of the principal reasons for the low average production of cows in the Union is that they are not fed properly. By weeding out the poor and giving the good producing cows better treatment and feeding, the production would be increased.

The following are some of the important points to be borne in mind in connexion with feeding dairy cows:—

1. Feed sufficient bulk.
2. Provide some succulent feed.
3. Remember that the common farm-grown feeds are deficient in protein, so, if possible, grow some legume.
4. Feed a variety of feeds; the bodily requirements are then more likely to be met.
5. Feed according to production: if all cows are given the same ration the poor producers may be overfed and the good producers underfed.
6. Furnish the cows with a regular supply of salt, the daily requirements being 2 to 4 ounces; and regularly with plenty of clean water.

—*Journal of the South African Department of Agriculture.*

DAIRY SUPERVISION.

THE PART OF THE SUPERVISOR.

By A. J. Gill, Dairy Supervisor.

There is apparently in many districts, where the provisions of the Dairy Supervision Act do not yet apply, an altogether erroneous idea of the object of the Act and of the supervisors' duties and the manner in which the duties are carried out.

When the Department of Agriculture took over the work of supervision of dairies and dairy farms in certain districts, it was realized that it would be essential to obtain the services of practical men acquainted with the different branches of farm work, who understood the difficulties under which farmers laboured, and who had some knowledge of the scientific side of the work.

When choosing supervisors, a three-days' examination of a written, oral, and practical nature is held. The examiners, while testing the candidates' knowledge, also note their temperaments, in order that men may be selected who, in addition to possessing the necessary technical qualifications, may be relied on to deal courteously and reason quietly with farmers. On entering the departmental service a supervisor is instructed in his work before being appointed to any district.

When Government supervision was initiated, farmers were inclined to show distrust of, and in some cases, hostility to the supervisor. It took time to gain their confidence, but they soon found that the supervisor's wish was to help them in every way, and that he was often able to give them many useful hints. When they realized that he would, if occasion demanded, ride miles through any sort of weather, perhaps after a hard day's work, to give first aid to a sick cow, farmers came to look on the supervisor as a friend, and to seek his advice whenever they could.

When the introduction of impervious floors in sheds and dairies was first suggested there was naturally some complaining, but when the improvement was made, the farmer found that his daily work was relieved of some of its drudgery, and that in the altered surroundings his chances of having purer milk and cream for sale were greatly improved. The advice and assistance of the supervisor enabled many to have the required work done for very little expense and without the cost of employing skilled labour.

The suggestions made at times by supervisors for detecting diseased stock have given a sense of relief to farmers, and advice to owners of dairy herds as to feeding, testing, and culling is gradually bringing about an improvement in the yields from cows, with consequent increased cheques from the factories. Recent statistics show that cows in districts where supervision obtains are yielding well over a 100 gallons more per cow yearly than those in other districts, and this superiority is the more gratifying when we remember that the districts not under supervision form a large portion of the most favorably situated and fertile portions of the State.

The following is a striking instance of what can be achieved by one prepared to follow the progressive method recommended by Government supervisors:—

A dairy farmer who owned a herd of mongrel dairy cows returning at the rate of about £17 per head for the year, purchased a pure-bred Jersey bull from a tested herd and a few pure-bred cows. With these he commenced to build up a good herd, paying the utmost attention to testing, culling, and feeding. The yield from this herd last year averaged 420 lbs. of butter-fat per cow for nine months, which at 1s. 6d. per lb. would mean a return of £31 10s. per cow. The calves from the mongrel herd were worth from £1 to £2; those from the present herd sell at from twenty to one hundred guineas, and during the last two or three years stock to the value of £500 has been sold. The present herd is worth, approximately, £1,100, while the value of the one it replaced was not more than £180.

In supervised areas the scrub bull is slowly disappearing. One supervisor proudly claims that the number of pure-bred bulls used in dairy herds in his district has reached a total of ninety. The farmer is being brought to realize the value of pure-bred animals. Herd Testing Associations are now being formed in different districts with the object of improving the herds, and one such association in Gippsland claims that 90 per cent. of the farmers in the test are using pure-bred bulls. The supervisors throughout the State are sparing no efforts to make the association a success.

Let me cite another instance in which the result of advice given by a supervisor to a farmer in his district can be given in money terms—

This farmer had been accustomed to send his cows away every winter when his pastures gave out. This cost him £40, and it sometimes happened that he lost a couple of cows. The supervisor of the district prevailed upon him to put a portion of his farm under cultivation, with the result that, not only was £40 a year saved, but all the cattle were kept in better condition.

In another district where cattle were liable to the trouble commonly known as cripples, the supervisor recommended top-dressing the pasture and a much better growth of grass and clover followed, and all trace of disease in the herd disappeared.

The aim of the supervisors is to improve the herds of the State from year to year and make dairying work less toilsome and more profitable, and so make farming communities more contented. Towards this end they have worked quietly, but that good results have followed in their train can be easily demonstrated.

The Manager of a leading butter factory in Gippsland expressed himself in the following terms when asked for his opinion regarding Government dairy supervision:—"There is no doubt that the Act is operating in this district, has proved and is still proving of great value to the dairying industry generally. Cream from this district compares more than favourably with that received from adjoining districts, and a large percentage of our inferior cream is received from farms that are not under Government control. The Act is sympathetically administered and the supervising officer is undoubtedly a great acquisition to the dairy farmers and to the industry. Under Government control there has been a steady improvement in farm conditions which has been reflected in the quality of cream. I have pleasure in expressing my opinion on this matter, and trust that the Government will see its way clear to take steps to bring the whole State under the supervision of the Government officers."

STALLION REGISTER, 1923-24,

under the "Horse Breeding Act 1919."

Part II.—Registration prior to 22nd August, 1923.

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
978	Abbey	A	Light	R. M. Smith	Landsborough
1078	Abbotsford II.	5	Draught	D. H. Adams	"Belmont," Elmore
973	Abdulla King	A	Pony	E. Stevens	Pranjip, *via* Longwood
828	Aberdeen	A	Light	W. Haymes	Ballarat
827	Abutilon	3	Draught	Jas. Walder and Sons	Watchem
1014	Admiral Wood	A	Light	A. G. Hunter	Elmore
870	Agitators Heir	A	Draught	G. R. Aurisch	Wattle Grove, Harkaway
694	Aitken Flower	3	,,	J. Walder and Sons	Watchem
931	Aleconner	A	Thoroughbred	G. A. Fairbairn	Terangaville, Kerrisdale
1003	Alister	A	Light	J. Williamson	Alister Vale, Newry
950	All Black	3	Draught	J. K. Allen	Numurkah
1026	All Brown	3	Light	J. R. Laity	Tandarra P.O.
617	All Green	A	Thoroughbred	R. Biggar	Waaia
759	All Scotch	A	Draught	Elliott and Dickens	Corowa, N.S.W.
666	All Tricks	A	Light	Mrs. J. C. Millard	Millbank, Condah
863	Allan Stewart	4	Draught	A. J. Gordon	Violet Town
979	Almont, M.	A	Light	J. Minns	Walsingham, Melton
919	Almont Rose	A	,,	P. Dermondz	Dunolly
1070	Altona	A	,,	C. Joiner	Echuca
847	Amanus	A	Thoroughbred	A. and J. H. Young	Blackheath
618	Argyle	A	Pony	R. Trimble	Rutherglen
1083	Ash Voyage	4	Light	Jas. Guthrie	Broken River, Shepparton
899	Avon Print	5	Draught	M. Barber	Walla Walla, N.S.W.
704	Aztic	5	Light	J. R. Regner	Panitya East
1144	Balnakill	A	Draught	R. J. Thomson	Brim
880	Bando	A	,,	Sharp and Taylor	City-road, South Melbourne
997	Baritone	5	,,	R. Humphrey	Cudgewa
1060	Baron	5	,,	W. Maguire	Barwidgee Settlement, *viâ* Myrtleford
1004	Baron Alexander	A	,,	Miller Bros.	396 Flinders-lane, Melbourne
991	Baron Bellum	2	,,	F. C. Coy and Coy.	Salt Creek, Woorndoo

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
992	Baron Bonanza	2	Draught	F. Fairbairn	c/o G. and C. Fairbairn, Dalgety's buildings, Melbourne
888	Baron Brilliant	2	,,	M. P. Murphy	Rupanyup
1142	Baron Carlyle	3	,,	P. Bagnell	Mologa
1095	Baron Cicero	2	,,	A. Covin	Nathalia
893	Baron Clover	3	,,	Trotman & Lord	Boigbeat
1192	Baron David	5	,,	Rose Fitzgerald	Allansford
993	Baron Dear	2	,,	Department of Agriculture	Werribee
802	Baron Douglas	4	,,	T. Maddern	Blackheath
1065	Baron Edendale	4	,,	H. Watkins	Euroa
826	Baron Faithful	A	,,	D. Barry, junr.	Culgoa
1066	Baron Fashion	4	,,	J. Burns	Delaforce, Euroa
994	Baron Gowan	2	,,	Department of Agriculture	Werribee
794	Baron Jock	5	,,	Mal Lynch	Hopetoun
920	Baron Minto	A	,,	Executors of W. Hermiston	Mansfield
907	Baron Newton	2	,,	L. W. Crapper	Neilborough
657	Baron Rosebery	6	,,	Wm. Allen	Junortown
862	Baron Shanter	3	,,	G. McKoy	Holbrook, N.S.W.
780	Baron Silk	5	,,	J. H. Meyer	Kaniva
1017	Baron Vale	3	,,	W. J. Hocking	Oakvale
1196	Baron Victor	2	,,	Manifold and Coy. Ltd.	Purrumbete, Weerite
787	Baron's Favourite	5	,,	W. Bodey	Dooen
770	Baron's Hero	2	,,	W. H. Allan	Broughton
807	Baron's Pride	2	,,	T. Shanahan	Glenpedder, Myrniong
996	Baron's Prince	4	,,	F. Bidgood	Sunnyside, Staghorn
1197	Baron's Star	3	,,	G. Oman	Lismore
836	Beau Gallant	A	Light	T. Dunlop	Birregurra
887	Bell Boy	3	Pony	F. R. Lovell	Ararat P.B.
629	Bell Boy Voyage	6	Light	K. N. McKay	Mitiamo
819	Bell Bronze	3	,,	M. D. Leehane	Charlton
709	Belmont Print	2	Draught	Mrs. D. Tweeddle	Waaia
1130	Belmont's Champion	A	,,	H. Scarse	Melton
790	Ben Model	5	,,	H. Adams	Yaapeet
620	Berra Bach	A	Pony	Timmins and Watson	Marnoo
1074	Bill Orange	3	Thoroughbred	W. J. Everett	Tongala
1114	Billy Baker	6	Light	J. L. Vallance	Cohuna
1052	Bingen	5	Draught	Watts Bros.	Kamarooka
835	Birdwood	A	Light	W. Morris	32 Ascot Vale-road, Newmarket
1135	Bismarck	A	,,	H. J. Manthorpe	Inglewood
876	Blackboy	A	,,	F. Stares	Longford
849	Black Rock	A	Pony	A. Shanks	Tooloy Bag, Lake Mundi

STALLION REGISTER, 1923–24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1075	Black Shepherd	5	Draught	G. Simpson	Yambrina, Tongala
1057	Black Steel	A	Thoroughbred	J. Cantwell	Walpeup
928	Black Voyage	4	Light	J. Penno	Marong
1174	Blair's Choice	5	Draught	W. M. R. Keam	Glenlea, *viâ* Gerang
841	Blue Ribbon	A	,,	D. McGrath	Manangatang
1116	Blue Trout	A	Thoroughbred	H. J. Robb	Thornton
1137	Blue Wilks	A	Light	H. Goujan	505 Howard-street, Ballarat
1136	Bob Ash	A	,,	Thos. Moore	Kialla East
964	Bobbie	5	Pony	I. E. Barratt	Traynor's Lagoon
874	Bogandyera	A	Thoroughbred	J. Hargreaves	Dederang
684	Bold Arthur	4	Draught	Jas. Galloway	Majorca
1099	Bold Baron	A	,,	R. L. Pearse	Kewell South
834	Bold Briton	A	,,	C. A. Schulz	Lake Hindmarsh, *viâ* Jeparit
773	Bold Captain	4	,,	T. Parker	Pepper Plains
749	Bold Dundonald	4	,,	C. Murphy	Wangaratta
747	Bold Jock	A	,,	J. Bayliss	Eaglehawk
1008	Bold Lad	A	Pony	G. Plant	Naneella
968	Bold McGregor	4	Draught	J. R. Duff	Narracoorte
1042	Bold Newton	A	,,	J. R. Mitchell	Sandford
933	Bold Wyllie	5	,,	Department of Agriculture	Brisbane, Queensland
665	Bolwalla	A	Thoroughbred	Harris and Dunne	Warrnambool
1191	Bonnie	3	Pony	F. H. Osborne	Cudgee
1030	Bonnie Abbott	4	Draught	W. G. Wilkinson	Yarrawonga
817	Bonnie Belmont	A	,,	J. T. Watkins	Euroa
1188	Bonnie Brag	A	,,	King Bros.	Kinrabulla P.O.
903	Bonnie Dundee	2	,,	Jas. Spedding	Woodstock West
957	Bonnie Everest	3	,,	Lansdowne Pastoral Coy. Ltd.	Queensland
951	Bonnie Salisbury	3	,,	C. H. Feldtman	Major Plains, *viâ* Goorombat
961	Bonnie Viceroy	2	,,	J. Bunge and Sons	Sheep Hills
660	Bonnie Voyage	A	Light	P. B. Glashem	Huntly P.O.
958	Boquhan Kennedy	A	Draught	W. Graham	Naring East *viâ* Numurkah
729	Bramhope Forester	A	,,	Mrs. A. E. Rodgers	Jacka Jacka, Tooan
761	Bramhope Kelm	3	,,	G. Hicks	Miram
1018	Breadwinner	A	Light	E. Prime	127 Lily-street, Bendigo
1112	Brecknock	A	Pony	R. Hentschel	Bonnie Doon
727	Breedon Pioneer	A	Draught	M. C. Ryan	Chetwynd
686	Brigham	3	Pony	J. E. Edwards	Tottington, St. Arnaud
1055	Brigham Shanter	A	,,	J. J. Wall	Numurkah
609	Brighams Last	A	,,	P. E. Baulch	Orford, *viâ* Port Fairy

STALLION REGISTER, 1923–24—*continued.*

Cert No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
980	British Admiral ..	A	Draught ..	W. Sheehan ..	South Muckleford
653	Briton's Pride ..	A	Pony ..	G. Kenworthy ..	211 Scott's-parade, Ballarat East
937	Bronte	5	Thoroughbred	A. Gillis ..	Newmarket
952	Brown Brilliant ..	3	Draught ..	J. T. Bartlett ..	Barnawartha
641	Brydon	A	,, ..	L. G. Parker ..	Darriman
872	Bundoora Black Leigh	6	Light ..	Miss B. B. Reid..	Blossom Park, Bundoora
654	Bushlark	A	,, ..	W. H. Penaluma	Boolarra
830	Caledonia	A	Draught ..	Withers Bros. ..	Bobinawarrah
873	Calland Dale ..	A	,, ..	J. E. Hooper ..	Devenish
806	Canary II. ..	5	Pony ..	G. T. Barber ..	Korweinguboora
621	Canberra	A	Draught ..	C. Bowland ..	Gunbower
630	Capitalist	A	,, ..	A. K. Urquhart..	Goonerah, Hexham
1054	Captain White ..	A	Thoroughbred	Robt. Gilder, junr.	Sale
652	Carden	A	Light ..	W. H. Penaluna	Boolarra
740	Carman	A	,, ..	W. Lane ..	Lucknow
705	Carmyle	2	Draught ..	A. McKinnon ..	Walpeup
987	Carolyn	A	,, ..	J. R. Peachey ..	Darlingford
706	Cedric Dale ..	4	,, ..	P. O. H. Thomas	Walpeup
917	Celmar Style ..	6	Light ..	W. Cochrane and Sons	Doveton-street, Ballarat
1032	Centrewood ..	A	Draught ..	C. E. Young ..	Main-street, Mornington
832	Champion of Kelmscott	A	,, ..	W. H. Robinson	Kerang P.B.
681	Cherry Farm Standard	5	,, ..	Dyke Bros. ..	Gre Gre Village
861	Cherry Vale ..	A	Thoroughbred	Jas. Wright ..	Beech Forest
1069	Cheviot	A	Light ..	M. Zimmer ..	Epping
1168	Clairs Pride ..	3	Draught ..	J. H. May ..	Joel Joel
728	Clarodon	A	Pony ..	Bennett Bros. ..	Coleraine
622	Clarendon II. ..	A	,, ..	C. Underwood ..	Timboon
643	Clarion	A	,, ..	W. H. Thompson	Yalca
805	Claymore Junior ..	3	,, ..	J. P. Hanrahan ..	Ballan
758	Cock Robin ..	A	Draught ..	T. G. Warren ..	Orbost
981	Coliban	A	,, ..	Wm. Todd ..	Taradale
1056	Colonel Garfield ..	A	,, ..	Millard Bros. ..	Dean's Marsh P.O.
714	Commonwealth ..	A	Light ..	S. Mathieson ..	St. Helens Plains
682	Conqueror.. ..	4	Draught ..	D. and M. McKinnon	Beazley's Bridge
974	Cosmopolitan 2nd ..	A	Light ..	Wade Bros. ..	Glenalvie P.O.
786	Count Bingen ..	5	,, ..	M. G. Porker ..	Green Park, Horsham
1093	Couper's Best ..	4	Draught ..	Baxter Bros. ..	North Mooroopna
959	Craig Derby ..	3	,, ..	A. R. Allan ..	Broughton, *viâ* Nhill
769	Craigieburn's Pride..	2	,, ..	W. H. Allen ..	Yanac
936	Craigielea of Aberdour	3	,, ..	Wilkinson and Young	Yarrawonga
1034	Crown Steel ..	A	Thoroughbred	J. Sharp ..	Minyip

STALLION REGISTER, 1923-24—*continued.*

Cert. No	Name	Age Yrs.	Class.	Owner.	Address.
789	Culcoon	3	Light	Mrs. M. Spargo	Nypo, *viâ* Yaapeet
1005	Cyanide	A	Pony	W. G. Reddick	Woorarra
751	Dalbora's Pride	2	Draught	Mrs. E. T. White	Mittyack
1094	Dalcrombie	2	,,	A. Colvin	Nathalia
1175	Dalmore Again	3	,,	J. A. Todd	Willenabrina North
793	Dalmore Pride	4	,,	W. T. McAlpine senr.	Hopetoun
764	Dalmore's Choice	2	,,	J. Bunge and Sons	Sheep Hills
765	Dalmore's Keynote	2	,,	J. Bunge and Sons	Sheep Hills
813	Dalmore's King	3	,,	J. G. Bunworth	Donald
698	Dalmore's Pride	5	,,	R. G. Heynam	Patchewallock
1006	Dan Patch Junior	A	Light	Jas. McCormick	Gateside, Knowsley P.O.
785	Dandenong	5	Pony	R. C. Ladlow	Dooen North
725	Dandy	A	,,	Campbell, R.	c/o. Cordite Factory, Maribyrnong
662	Dandy Again	A	,,	R. Lawler	Ouyen
904	Dandy Direct	5	Light	Wilkinson and Graves	Manangatang
667	Dandy Duke	A	Pony	Kong Meng Bros.	Longwood
871	Dandy Junior	A	,,	Robt. Withers	Bobinawarrah
1153	Dandy Lad	A	,,	Stuckey Bros.	Flynn's Creek
940	Dandy Lad	A	,,	A. C. Head	Seymour
1021	Deck Top	A	Light	Mackin Bros.	Korong Vale
1081	Dinkum Direct	2	,,	R. McLarty	Mitchellstown, *viâ* Nagambie
1068	Direct Kola	4	,,	J. A. Wilson	Pira, *viâ* Swan Hill
1063	Director	4	,,	J. Jeffrey	Echuca
649	Dixie Boodle	A	,,	P. V. Fraunfelder	Wodonga
1161	Dixie Jim	2	,,	J. G. Gardner	Rogers-street, Wangaratta
738	Domination	A	Pony	C. T. Lucas	Pomberneit
922	Don Huon	A	,,	W. Lyons	Drouin P.O.
913	Don Marvin	A	Light	J. Rousch	236 Nicholson-street, Footscray
865	Don Olive	A	Pony	A. Cheesley	Barnawartha
976	Don Tourie	A	Light	J. Dillon	Manangatang
707	Donald Dale	4	Draught	J. Frith	Torrita
879	Donibristle	A	,,	Trustees of Wilson Estate	Home Station, Milawa
1127	Donvin Chimes	3	Light	J. D. Mulfahey	6 Service-street, Albert Park
1100	Douglas Chief	A	Draught	W. G. Sallman	Dimboola
955	Douglas Knight	3	,,	Australian Estates and Mortgage Co. Ltd.	114 William-street, Melbourne
801	Douglas Prince	3	,,	E. W. Harders	Box 61, Dimboola
1051	Drummond King	A	,,	W. Watts	Wamarooka
900	Drumry Equipment	6	,,	J. Maher	Tatura
1186	Dugald Dalgetty	3	,,	H. Davies	Curlewis
744	Duke Little Eyes	A	,,	A. E. Bowman	Fairy Knowe, Tallangatta

STALLION REGISTER, 1923–24—*continued.*

Cert. No.	Name.	Age. Yrs.	Class.	Owner.	Address
1025	Duke of Winton	4	Light	W. C. Bain	Lake View, North Winton
1126	Dunaskin	2	Draught	J. H. Pickin	Coleraine
1102	Duncan Stewart	6	,,	J. Fitzpatrick	Heyfield
669	Dundonald's Chief	A	,,	H. Doherty	St. James (Vic.)
1041	Earl of Claymore	2	,,	J. Hiskins	Rutherglen
1146	Eaton Headlight	5	,,	E. W. Schneider	Yulecart
1147	Eaton's Pride	3	,,	G. Grey	Branxholme
708	Eclypse	2	,,	A. McKinnon	Walpeup
1182	Electioneer	A	Light	G. J. Shaw	Yarram
748	Emerson	5	Thoroughbred	A. S. Blair	Box 30 Watchem
1167	Ercildoune Dick	A	Pony	D. Gardner	Ercildoon, Milawa
814	Estelle Junior	4	Light	D. Green, junior	Mullawil
923	Ettrick	A	Draught	A. Gordon	Violet Town
946	Fabric Again	3	,,	Colvin, A.	Nathalia
850	Fabric's Heir	6	,,	Department of Agriculture	Brisbane, Queensland
972	Fabrikoff's Heir	3	,,	W. Cheesley	Barnawartha
1171	Factotum	4	,,	G. Buckley	Wickliffe
1020	Falmouth	A	Thoroughbred	W. R. Cullen	Wahgunyah
623	Fashions Model	A	Draught	A. B. Hamilton	Riccarton, Fish Creek
1165	Federal Duke	A	,,	J. Hendry	Bridgewood
1040	Federal Sail	5	,,	J. D. Rhodes	Daysdale, N.S.W.
818	Fidelio	A	Thoroughbred	T. H. Smith	Lalbert
984	Firebrick	A	Light	P. Higgins	Cowwar
954	First Admiral	6	Draught	A. Stewart	Donald
658	First Voyage	A	Light	P. H. Busst and P. B. Glacheen	Huntly P.O.
1172	Fitzallans Model	3	Draught	A. E. Male	Glenthompson
891	Flash Dale	3	,,	T. Bagnell	Yarrawalla
717	Flash Donald	A	Light	W. J. Collins	Woomelang
1085	Flying Possum	6	Pony	H. E. Woods and Sons	Mooroopna
966	Foamy Voyage	5	Light	A. V. Mahar	Kerang
867	Footwork	5	,,	J. Chapman	Ouyen
1176	Forrest King	3	Draught	G. Meek	Kimma Kat Ka
999	Free Scot	A	Light	T. Robertson	Moyne Falls, Macarthur
977	Fulham Bells	4	,,	J. B. Gannon	34 Williamstown-road, Port Melbourne
631	Gallant Lad	A	Draught	H. Gould	Yaapeet
1000	Garfield Junior	A	Pony	F. B. Turner	Glenthompson
642	Garnet	A	Light	J. J. Carmody	Leongatha
1043	Gay Gordon	A	Pony	J. R. Mitchell	Sandford
724	Gay Voyage	A	Light	P. A. Beaumont	Ouyen
995	General Jess	2	Draught	D. L. Bodey	Jung
820	General Ribbonwood	A	Light	A. Simpson	South-road, Moorabbin
930	General Wallace	5	Draught	J. T. Bartlett	Barnawartha
1092	George Wilks	4	Light	H. D. Adams	Kotupna
624	Gillies Son	A	Draught	Boyd Bros.	Yarrone, Koroit
775	Glen Arthur	5	,,	A. Arnold	Warracknabeal

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
691	Glen Direct	4	Light	P. Whitechurch	Box 168, Mildura
932	Glenalla	4	Draught	Department of Agriculture	Brisbane, Queensland
896	Glendale	5	,,	McEnroe	Western Australia
864	Glendale	6	,,	R. C. Gulliver	Balldale, N.S.W.
970	Glenmore	5	,,	A. Colvin	Nathalia
613	Glenscott	A	,,	P. McNeil	Box 75, Sea Lake
723	Glyn Trustful	A	Pony	Roth Bros.	Ensay
975	Gobbler	6	Draught	A. Knight	Lake Bolac
1046	Gold Dust	A	Light	Mrs. M. Birss	Stradbroke
852	Gold Mauritius	5	,,	C. Potts	Crosbie-road, Murrumbeena
1009	Golden Action	A	,,	H. W. Newson	Garden-street, Essendon
1156	Golden Hue	A	,,	A. W. Cardinal	Nalangil P.O.
1019	Goldie	A	,,	W. J. Minns	Melton South
1113	Governor Wilks	3	,,	J. Collins	Nathalia P.O.
886	Grampian Lad	4	Draught	A. Richards	Gymbowen
1016	Grand March	A	,,	W. M. Hughes	Belmont Hill, Inglewood
659	Grattons Voyage	A	Light	Busst and Glasheen	Huntly P.O.
1013	Hamilton Emulator Junior	A	Pony	Todd Bros.	Willenabrina North
1103	Hamilton Hero	A	Draught	A. Booley	Banyan, *viâ* Woomelang
971	Hampton Ben	A	,,	P. Zealander	Warracknabeal
1199	Harlequin	A	Pony	L. Morcombe	Snake Valley
935	Harold A.	A	Light	H. J. Blackie	Ararat
745	Harold Direct	6	,,	J. Glenn	Tylden
721	Here's Luck	A	Pony	C. J. Anderson	Tarranyurk
625	Herward Junior	A	Light	J. A. Haebich	Bittern
851	High Commander	A	Draught	Griffiths Bros.	Gretaw
837	High Degree	A	,,	Schroeder Bros.	Murrayville
644	Highland Boy	A	,,	S. E. Moss	Quambatook
939	Highland Fancy	A	,,	Hildebrand, G.	Leitchville
1049	His Majesty	A	,,	M. Frawley	Leigh Creek
1117	Honest Cleve	A	Light	Wm. Eichler	Chillingollah
877	Honest Wilks	A	,,	H. D. Adams	Kotupna
846	Honey King	A	,,	O'Loughlin Bros.	Leongatha
737	Hotspur	A	Pony	Z. L. Small	French Island
1148	Hullabaloo	A	Light	G. Bennett	Chinkapook
1173	Humoresque	5	Pony, Shetland	A. C. Bayley	Willaura
815	Huon's Joy	5	Pony	C. S. Wade	Bronzewing
664	Ian McClelland	A	Draught	H. Naylor	Roseberry East
1139	Idris	2	Light	S. Winter-Cook	Murndal, Hamilton
663	Imperial Crown	A	,,	T. G. Maher	Bush Inn Hotel, Purnim
626	Interest	A	Pony	A. Kennedy	Arcadia
1091	Inverness	2	Draught	A. Colvin	Nathalia
695	Inverness Bute	2	,,	J. Walder and Sons	Watchem
905	Jack Gratton	3	Light	J. Evans	Morrl Morrl, *viâ* Stawell

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age. Yrs	Class.	Owner.	Address
719	Jack Huon	A	Light	F. G. Ronalds	Warrenheip-street, Buninyong
768	Jack Tar	4	Draught	J. J. C. Dufty	Lorquon West
1050	Jet	A	Pony	D. H. McConnell	Longford
1028	Jimmy Direct	5	Light	J. Isaac	Inglewood
757	Jock	A	Draught	G. T. Wolstenholme	Milawa
1160	Jock Cedric	4	,,	J. W. Gardner	Cavendish
687	Jock MacGregor	2	,,	Reseigh and Flockart	Culgoa
1184	John Brigham Last	A	Pony	J. Toogood	Hawkesdale
1163	Judge Byron	A	Light	A. S. McColl	Seaspray, Sale
1155	Julius of Bolobek	4	Draught	E. Allan	Ondit
938	Justice	5	,,	Sir R. Clarke	Lancefield Junction
627	Kelly	6	Pony	S. Pianta	Murtoa
683	Kelvin	3	Draught	D. and M. McKinnon	Beazley's Bridge
1007	Kemp Daly	A	Light	G. H. Minns	Melton
965	Killawney	4	Draught	J. E. Oram	Marnoo
1010	Kilmore	A	,,	J. Russell junior	Orbost
628	King Albert	A	,,	T. McKay	Malmsbury
882	King Bally	A	Light	F. Lee	Clunes
716	King Bee	A	Pony	W. T. McAlpine	Hopetoun
772	King Jack	2	Draught	A. A. Zanker	Jeparit
908	King John	4	,,	A. Cail	Kamarooka
1119	King of the Valley	A	,,	Jas. Murdoch	Lake Bolac
1109	King Osterley	A	Light	J. M. Fahey	Gnotuk
842	King Stanley	A	Draught	E. Land	Oxley
859	King Treasure	2	,,	J. G. Bail	Kyabram
1089	King Victor	4	,,	A. Dunning	Numurkah
1157	King Wilkes	A	Light	J. Brights	Stony Creek
792	King's Own	4	Draught	E. Johns	Gama
645	King's Own	A	,,	J. Denham	Leongatha
655	King's Treasure	A	Thoroughbred	G. Ritchie	Mansfield
949	Kitcheners Pride	4	Draught	H. C. Younger	Wattle Hill, Greta
696	Lancashire Chief	3	,,	R. Bunworth	Woomelang
811	Langdale	4	,,	M. Donnellan	Jeffcott North
929	Larrakin	5	Light	F. A. Rigby	Box 7, Walpeup
741	Leeway	A	,,	W. G. Robertson	Hesse, *via* Wingul
866	Leo's Pride	A	Pony	Miss Small	Nyora-road, Glen Iris
916	Lilburne Regent	A	Draught	J. Hargreaves	Dederang
752	Little Black Pony	A	Pony	Jessie M. Armstrong	Branxholme
632	Little Pos	A	Thoroughbred	A. K. Urquhart	Boonerah, Hexham
679	Lonsdale Again	3	Draught	T. Zimmerman	North Devin
918	Lord Bindi	A	,,	R. T. E. Yapp	Tambo Upper
1133	Lord Lascelles	4	,,	Sharp and Taylor	Glenarona, High Camp
848	Lord Lyndem	A	,,	Jas. Vickers	Colbinabbin West
1110	Lord Percival	A	,,	J. M. Fahey	Gnotuk
726	Lord Pilatus	A	Thoroughbred	J. R. McBean	Goroke

STALLION REGISTER, 1923-24—*continued.*

Cert. No	Name	Age	Class	Owner.	Address.
		Yrs			
921	Lord Throve	6	Draught	W. J. Schmidt	Jeparit
889	Lord Wallace	4	,,	W. Belleville	Galah
678	Lothian Again	2	,,	Dyke Bros.	Gre Gre Village
808	Lucky Boy	2	,,	Graham Bros.	Bacchus Marsh
884	McAgain	5	,,	T. R. Buffham	Horsham
784	McKinney Star	6	Light	Noel Bros.	Terang
800	Mac's Fancy II.	4	Draught	A. C. Jorgensen	Katyil
1038	Magic Railway	4	Pony	Jessie Wilkin	278 Toorak-road, South Yarra
677	Magnet	3	Draught	K. Cameron	c/o. Young Bros., Warracknabeal
924	Mahomet	A	Pony	A. Brown	Rupanyup
1151	Major Again	6	Draught	H. M. Bywater	Babrootam North
702	Major Clyde	5	,,	J. J. Gleeson	Corack East
783	Major Gratton	3	Light	R. N. Keating	Antwerp
1045	Major Jock	A	Draught	F. C. Glanville	Echuca North
989	Major Mark	4	,,	C. H. Feldtman	Major Plains, Dookie
1064	Major Style	4	,,	P. Daldy	Arcadia South
1107	Major Style	A	,,	R. Gutheridge	Silvan
646	Major Thornley	A	,,	T. Torpey	Turriff
699	Malleepecker	4	Thoroughbred	A. T. Finch	Speed
736	Mambrimo Wilkes	A	Light	J. Brown	c/o. Mrs. Cowell, Baillie-street, Horsham
701	March Along	3	Draught	H. Carr	Manangatang
869	Marmaduke	A	Pony	A. J. Gillies	Noorat
969	Marquis Bold	3	Draught	W. Turnbull	Wedderburn
760	Master Dix	A	Thoroughbred	P. T. Larsen	Eskdale
650	Melrose Bounty	A	Light	Melrose Dairy Pty. Ltd.	c/o. Glenferrie and Malvern roads, Malvern
647	Menkawrah	A	Thoroughbred	J. L. Vallence	Cohuna
914	Merry Chimes	3	Light	F. W. Rangott	Chillingollah
718	Merry King	A	Pony	W. F. Maroney	Wangaratta
857	Merven Chief	3	Draught	J. G. Bail	Kyabram
1012	Metal Bells	5	Light	H. Colvin	Nathalia
1104	Mickey	A	Pony	R. Booley	Banyan, *viâ* Woomelandg
706	Middlerigg Referee	4	Draught	C. Lindner	Murtoa
947	Middlerigg What's Wanted	A	,,	E. McKoy	Wodonga
1001	Miniature 3rd	A	Pony	T. Robertson	Moyne Falls, Macarthur
671	Minstrel	A	,,	D. Begley	Colac
915	Models Herod	5	Draught	M. Hutcheson	Pine Grove *viâ* Mitiamo
1059	Monach	3	Thoroughbred	J. Bell	Mudgegonga, Myrtleford
673	More Huon	A	Light	H. E. Fisk	Leongatha
1121	Moredun Ranger	3	Draught	J. R. Mitchell	Sandford
776	Morocco Chief	2	,,	A. Arnold	Warracknabeal

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
788	Moving On	4	Light	H. Fisher	Yaapeet
988	Moving Picture	A	„	W. Fisher	Yaapeet
963	My Chimes	3	„	J. M. Cromie	Swan Hill
1084	Napar	A	„	E. Land	Oxley
774	Newfield's Pride	5	Draught	J. M. Martin	Aubrey-road
831	Newton Lad	A	„	T. N. Skinner	Bordertown, South Australia
692	Niggering	4	Light	E. G. Traeger	Merbein South
1145	Noble Glen	3	Draught	W. Nagorcka	Tarrington
1031	Non Pareil	5	„	W. Geddes	Boomahnoomoonah
804	Norman's Pride	3	Pony	A. Harrington	Leigh Creek
1073	Novel Print	4	Light	P. Maher	Tatura
1098	Nyallo Prince	6	„	W. T. McAlpine, junior	Hopetoun
1015	Onward Star	A	Draught	J. W. Murchison	Dumbalbalane
1154	Onward's Pride	2	„	J. Hannebery	Miepoll
661	Orion	A	Thoroughbred	W. D. Cross	Tangambalanga
934	Our Bobby	A	Pony	R. P. Gardiner	Lurg, *viâ* Benalla
1086	Owyhee Chief	A	Light	J. Shanahan	4 Corsair-street, Richmond
1105	Palos	A	„	R. Warren	West Moolap P.O.
1118	Patrician	2	Draught	R. and A. McClelland	Lara
633	Patrick's Pride	A	„	E. L. Edwards	Avenue-road, Bacchus Marsh
838	Patriotic	A	„	H. L. Ferry	Buangor
967	Periscope	A	Light	J. and M. Ervin	Pyramid
735	Peter	A	„	J. Carroll	Mudgegonga
854	Pettadale	5	Draught	N. Ramsay	Newbridge
1077	Pettadale II.	3	„	T. Lees	Rochester
855	Phylactery	A	Thoroughbred	A. B. Gibbons	Cohuna
825	Ploughboy	A	Draught	P. Donovan	Learmonth
675	Plucky Willie	3	„	R. Wetherington	c/o. Young Bros., Horsham
634	Plumlea	A	Light	P. Fischer	Weidermann's L.B., *viâ* Jeparit
856	Politician	A	„	W. J. Wood	Moyhu
637	Premier Lauder	6	Draught	G. S. Wall	Gowangardie South
799	Premier Success	3	„	P. H. Müller	Dimboola
1158	Premier Thomas	A	„	A. McDonald	Chillingollah East P.O.
635	Preston	A	Pony	E. McEvoy	Colbinabbin
1141	Pride	A	„	F. Mitchell	Walwa
839	Prince Alexander	A	Draught	Trask Bros.	Warncoort P.O.
1106	Prince Charles	A	Pony	J. Dawkins	Colac
782	Prince Dale	2	Draught	J. Downey and Son	Wallace
1033	Prince Edward	A	„	D. King and Sons	Rutherglen

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age	Class.	Owner	Address.
		Yrs			
875	Prince Ettrick	A	Draught	A. R. Paynter	Violet Town
1048	Prince Harold	A	Pony	H. Robertson	Wallacedale
1200	Prince of Lorne	A	Draught	E. H. P. Young	Congupna-road
1187	Prince Wigton	3	,,	K. McKenzie	Werribee
858	Rainy Voyage	2	Light	J. G. Bail	Kyabram
1169	Real Scotch	6	Draught	J. Rumbold	Laanecorrie
1149	Red King	A	Light	Wm. Holland	Benambra
670	Regis	A	Draught	E. Manifold	Camperdown
781	Reisorel	5	Light	W. G. Parish	Horsham
697	Review	4	Draught	J. Donnan	Watchupga
1023	Richard Cleve	A	Light	R. Parker	Kongwak
1150	Rifle Boy	A	Pony	P. R. Cooke	Euroa
885	Rising Star	5	Draught	Timmins and Watson	Marnoo
1129	Roala	4	Pony	B. E. Lyon	Coleraine
755	Robert Alto	A	Light	A. Kennedy	Arcadia
1096	Robert Bruce	5	Draught	H. Gregerson	Benalla
1122	Roger Bold	3	,,	R. T. Mitchell	Sandford
824	Ronyas Bells	A	Pony	M. M. Saynor	46 Elgin-street, Hawthorn
941	Roseberry	A	Light	F. McKoy	Wodonga
798	Rosedale	2	Draught	P. H. Müller	Dimboola, Box 88
651	Rothmont	A	Light	J. A. Kirkpatrick	Lismore
823	Roy	A	Pony	J. B. Cleeland	Newhaven, Ph. Is.
762	Royal Bill	5	Draught	W. J. Collins	Beulah
1159	Royal Bob	A	,,	D. Treweek	Red Cliffs
910	Royal Charm	4	,,	T. H. Smith	Lalbert
796	Royal Chief	4	,,	W. G. Burns	Goroke
1076	Royal Craig	5	,,	D. Trewick	Elmore
753	Royal Crown	A	,,	J. A. Goodwin	Wunghnu
925	Royal Douglas	A	,,	T. Thornton	Waaia
1120	Royal Escort	A	,,	Hooper Bros.	Devenish
688	Royal Fashion	5	,,	A. J. D. McRae	Gre Gre North
648	Royal Gartley	A	,,	C. P. Butler	Warracknabeal
853	Royal Hero	5	,,	R. J. Keating	Hillside
713	Royal McGregor	5	,,	Vallence Bros.	Nullawil
1090	Royal Main	4	,,	A. J. Trevaskis	Murchison
840	Royal Robin	A	,,	T. W. Bridgett	Charlton
1181	Royal Rufus	6	Light	L. Morrison	Fredrick-street, Yarraville
1088	Royal Scotty	4	Draught	S. Fawcett	Numurkah
795	Royal Simon	3	,,	J. Patching	Gymbowen
668	Royal Style	A	,,	McQueen Bros.	Waubra
1035	Royal Style	4	Light	J. Isaac	Inglewood
636	Rufus	A	Thoroughbred	W. Jubb	Hexham
878	Rufus	3	Draught	Mrs. S. E. Kent	Sheep Hills
909	St. George	2	,,	C. H. Jackman	Tandarra
1071	Safe Voyage	5	Light	D. Murchison	Katamatite
1177	Sandy's Fashion	4	Draught	E. Haines	Gerung
1190	Santa Claus	3	Pony	W. Henderson	Grasmere
756	Santrel	A	Light	R. W. Storey	Murchison East
983	Sarsfield	A	Pony	C. W. Heaney	Kilmore
1072	Scotch Lynn	2	Draught	P. Hartigan	Byrneside
1193	Scotch Willie	2	,,	McKenzie Bros.	Wallup

STALLION REGISTER, 1923–24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1036	Scotland Again	2	Draught	T. J. Witherow	Wangaratta South
1166	Scotland's Peer	A	„	D. Gardner	Milawa
894	Scotland's Signet	A	„	W. Ramsay	Newbridge
797	Scotland's Viceroy's First	4	„	P. B. Miller	Katyil
777	Scotland's Victory	3	„	J. S. Gray	Sheep Hills
1022	Scottie	A	„	T. Fullam, junior	Torrumbarry P.O.
953	Scottish Laird	4	„	T. Edson	Glenorchy
1178	Scottish Prince	A	„	R. D. Buckley	Lawloit
1132	Scotty Chief	A	„	W. W. Merrett	Custon, South Australia
674	Selkirk	A	Light	A. Scott	Elmore
906	Selsiam	3	„	T. Edson	Glenorchy
822	Seymour	A	Draught	J. Cleeland	Newhaven
829	Shepherd	A	„	J. R. May	Beulah
680	Shepherd	3	„	W. H. Holmes	Rainbow
1123	Shepherd's Pride	4	„	E. J. Black	Casterton
1183	Shirley Bantam	A	Light	B. Gannan	Penshurst
821	Silver Bells	A	„	T. Coonertz	Yarragon
656	Silver Claim	A	Thoroughbred	M. Hutcheson	Pine Grove P.O.
990	Simon Again	4	Draught	C. T. Wallis	Lockwood
638	Sir Angle	A	Light	L. S. Cadman	Corryong
690	Sir Dale	5	Draught	A. Sands	Sea Lake
733	Sir Richard 2nd	A	Pony	W. Henderson	Grasmere
1143	Sir Rupert	4	Draught	G. Kelly	Diggora
712	Sir Walter Burnside	3	„	F. Schroeder	Murrayville
998	Sir William	5	„	McQueen Bros.	Waubra
732	Smart Style	A	Light	R. Davis	Kunat
1047	Southern Star	A	Draught	L. Curran	Cannie
945	Southerton	A	Light	F. Mason	Stawell
1111	Speculation	5	„	D. F. Bourke	Rochester P.O.
810	Sportsman	3	Thoroughbred	R. Davison	Donald
754	Sportsman's Hero	A	Draught	A. Kennedy	Arcadia
1082	Squire Belmont	4	„	H. Trimble	Pine Lodge R.S.
897	Stamperland Star	3	„	A. Gillies	Racecourse-road, Newmarket
883	Starlight	A	Pony	J. Giles	Bairnsdale
703	Stivious	4	Light	A. W. Lackman	Murrayville
890	Stockart	3	Draught	O. Olson	Jeparit
771	Stockman's Lad	5	„	J. F. A. Schulz	Lake Hindmarsh, Jeparit
1180	Sudbourne's Chief	3	„	A. J. Porter	Seymour
720	Suggestion	A	Thoroughbred	A. T. Heath	Warracknabeal
1080	Sultan	4	Light	M. Swan	Avenel
693	Sum Time	3	Draught	J. H. Thomas	Yatpool P.O.
1125	Taffy	A	Pony	H. Jarvis	Omeo
715	Taffy	A	„	A. W. McIntyre	Dunkeld
672	Taffy	A	„	J. Sargeant	Yanac
1039	Tenor Voyage	4	Light	F. Siebel	Thomastown
602	Territorial	A	Draught	R. M. Thomas	Devon North
1128	The Banker	4	„	A. Templeton	Coleraine
601	The Butler	A	Light	H. Carter	Natimuk
1198	The Colonel	4	Draught	McDonald Bros.	Mortlake

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
982	The General	A	Light	D. Shelley	Bungaree
942	The Macdonald	A	Draught	A. Wohlers	Mt. Wallace, *vid* Ballan
731	The Masher	A	Light	Wm. Williams	Strathmerton
603	The Nipper	A	Pony	T. H. Bush	Pennyroyal
1108	The Retainer	A	Light	W. McGowan	Sea Lake
1140	The Roster	4	,,	A. Rogers	Horsham
845	The Trick	A	,,	W. Mellington, jnr.	Rainbow
1024	The Verger	A	,,	E. Bowman	Ebden
1062	The Voyager	5	,,	H. H. Nairne	Tongala
1037	Thornstone	4	Thoroughbred	C. Hoysted	Glenrowan
895	Timely Direct	4	Light	J. M. Cromie	Swan Hill
1162	Tinytown	A	Pony	J. Deane	North Essendon
927	Titiroa Baron	A	Draught	A. Courboules	Cape Clear
1124	Tom Thumb	A	Pony	W. F. Eichler	Chillingollah
1101	Tom Walton	A	Draught	Cameron and McKenzie	Warracknabeal
604	Tommy	A	Pony	Boyd Bros.	Tarrone, Koroit
1185	Tommy Dodd	4	,,	Boyd Bros.	Minhamite
816	Tommy Huon	A	Light	J. Watkins	Euroa
1179	Tony Bells	A	,,	R. Hannah	Lilydale
640	Torfrid	A	Thoroughbred	D. Rogers	Boolara P.O.
605	Tracey Boy	A	Light	Smith and Sons	Mernda
1044	Tracey Voyage	5	,,	Mackin Bros.	Korong Vale
742	Tresco	A	,,	A. E. Bowman	Ebden
779	True Blue	4	Draught	C. S. Maddern	Kaniva
1097	Typical Voyage	3	Light	W. B. Harris	Cobram
1195	Udale Jack	4	Draught	Manifold and Co.	Woorite
926	Union	A	Pony	W. A. Anderson	Allansford
1189	Unit	5	,,	B. Rogers	Mepunga East
676	Valmour	3	Draught	R. Hetherington	Mt. Gambier
1152	Vanguard	A	,,	G. and W. Lord	Rosedale
843	Vanquisher	A	,,	J. Meagher	Murrayville
960	Vice Regal	3	,,	A. E. Petering	Minyip
962	Vice Regal	4	,,	Mrs. I. B. Walker	Swan Hill
763	Viceroy Yet	2	,,	J. Bunge and Sons	Sheep Hills
778	Viceroy's Wonder	3	,,	W. Schultz	Warracknabeal
943	Vocal King	A	Thoroughbred	A. W. Giddings	Sea Lake
956	Waituna	3	Draught	S. A. Greaves	Narre Warren
948	Wakapero	4	,,	G. E. Jenner	Kerang East
860	Waverley Glen	4	Pony	A. R. Dalton	Hotham-street, East St. Kilda
944	Wee Jim	A	,,	E. R. Pickering	Portarlington
1138	Wee Key	4	,,	R. Kirkwood	Byaduk North
619	Welcome Abbey	A	Light	Jas. Button	Ballarat North
833	Welsh Flyer IV.	A	Pony	J. Williams	Nalinga
743	Weralte	A	,,	A. E. Bowman	Ebden
844	Western Lad	A	Draught	J. and C. Ross	Lake Bolac
606	Westmont	A	Light	Wm. Hay	Bullock Swamp
1194	Whip Voyage	4	,,	J. Peters	Cobden
1011	White Star	6	,,	G. Kelly	Powlett Plains
750	Who's Who	5	Pony	F. Fairbairn	Dalgety's buildings, Bourke-street, Melbourne
739	White Stockings	A	Light	Munro Bros.	Walpeup

STALLION REGISTER, 1923-24—*continued.*

Cert. No.	Name.	Age. Yrs.	Class.	Owner.	Address.
791	Widgiewa Belmont	3	Draught	C. H. Perkins	Rainbow
1079	Widgiewa Edward	4	,,	W. G. Down	Koonda P.O.
710	Widgiewa Fashion	4	,,	W. and L. Oliver	Diggora West
1029	Widgiewa Ivo	5	,,	W. G. Wilkinson	Tungamah
1087	Widgiewa Marshall	4	,,	J. Christie	Katunga
722	Wiewood	A	Light	W. Raftery	Shepparton
607	Wigtonshire	A	Draught	J. Cobain	Sale
803	William Sportsman	3	,,	W. A. Dehnert	Ballan
689	Willie Craig	5	,,	G. Oxley junior	Gre Gre North
608	Winsome Chief	A	,,	Peterson and Bourchier	Kellalac
610	Winter Wild	A	Light	F. A. Mitchell	49 McGregor-street, East Malvern
812	Wizard Junior	A	Pony	J. A. Goodwin	Wunghnu
898	Worthy Mac	4	Draught	J. Elliott	Kyabram
611	Wotan	6	Thoroughbred	Dickinson Bros	Sebastopol
881	Yet Again	A	Pony	J. Beard	Terang
1061	Young Buchlyvie	3	Draught	J. K. Hamilton	Stanhope P.O.
1164	Young Clyde	A	,,	J. Ludeman	Brucknell
612	Young Clydeside	6	,,	W. Fozard	Bendigo
868	Young Cymra Bach	A	Pony	C. H. Holmes	Jil Jil
809	Young Dan	5	Draught	J. R. Tonkin	Mt. Jeffcott
614	Young Dandy's Pride	A	Pony	J. W. Powell	Beeac
1002	Young Ki Ki	A	,,	T. Robertson	Macarthur
892	Young Lad	4	,,	W. H. Gillett	Lara
639	Young Major	A	Draught	C. Gould	Tatyoon P.O.
730	Young Patrician	A	,,	F. E. Southwell	Linga
986	Young Repeater	A	,,	A. W. Lackmann	Murrayville
1131	Young Rysharold	A	Pony	W. Brown	43 Princes-street Fitzroy
901	Young Several	3	Thoroughbred	L. Tognoline	Tandon
615	Young Shifter	A	Light	A. Linke	Jeparit
685	Young Simon	3	Draught	G. J. Butler	Carisbrook
616	Young United Prince	A	,,	W. G. Young	Neerim

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

SPRAYING.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray in a pump barrel that has not been washed out, very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shot hole, and other fungus diseases must be kept in check. As various sprays are required for all of these troubles, the necessity of always having a clean pump is evident.

At the present time the best spray for peach aphis is strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this latter insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a large number of buds if this insect be sprayed. Nicotine solution, pine spray, or lime sulphur may be used with good effect.

CULTIVATION.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover, and if the orchard soil is at all heavy or stiff, the grower should make up his mind to grow a crop next season, in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cutworm moths, &c.

GENERAL WORK.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass, or straw mulching not too rich in animal manure.

The disbudding of unnecessary shoots and the pinching back or stopping of growths, to prevent their becoming unduly long, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, and, after planting, they should be watered and mulched.

The Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back; crowded bunches and shoots should be thinned; the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June. Pull up and burn all plants showing any signs of disease.

Any potash manure may be used to assist in combating the spotted wilt.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into flowering and lateral growths. Watch the plants for mildew, and use sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it would be well to dip the whole plant in water before planting This greatly assists the young plants while taking hold of the soil in their new location

Frequent waterings and frequent cultivation will now be necessary, and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

The Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladioli, and seed of such tender annuals as Phlox Drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos and portulaca.

While seeds planted out in the open germinate and grow fairly well, it is advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need be on the one side only, preferably the west or north-west; the seedlings are then protected during the hottest part of the day. At the same time the shading should not be sufficient to unduly "draw" them.

The seeds should not be deeply sown, and all waterings should be light. A little water, often, should be the rule for seedlings. Annuals require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have space to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias may now be planted out, either from tubers or from young rooted cuttings. These will give good early summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for protection; included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy.

the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

REMINDERS FOR DECEMBER.

SHEEP.—Dispose of all faulty-mouthed ewes, inferior-fleeced coarse-flock sorts in best condition at any time possible. Those in favoured areas should replace with younger, finer-grade sorts. Where ewe lambs are intended to be held for future breeding, see that the cross results in shafty, fine to medium grade fleeces, as well as a shapely frame. Allow rams to remain with the ewes at least seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. Where conditions justify it, 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring a greatly increased number of twin lambs. Clear wool from eyes, and burrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed, or as near one cross as possible, to insure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. It is useless to join rams with ewes until their proper time of coming in season. Ewes carry their lambs four months, four weeks, four days, or roughly, five months.

BEE-KEEPING.

December is the month for the main honey flow from yellow box and red gum. Swarming is practically over for the season except, perhaps, in late districts. Where there has been more swarming than the owner of the bees desired, and the total yield of honey is the object aimed at rather than increase in the number of colonies, the weaker stocks may be united at the commencement of the honey flow, as the highest return is secured by having a given number of bees in the fewest possible number of hives; that is to say, 50,000 worker bees in one hive will store a far greater amount of honey than the same number in two hives with 25,000 bees in each. Such a large worker-force requires three bodies of full-depth frames, otherwise the best results cannot be obtained, because nectar being as thin as water when brought in by the bees, only a little is put into each cell to hasten evaporation. When, therefore, sufficient empty combs are not available to the bees, part of the worker-force will be idle.

Each colony should have at least three sets of Langstroth size combs, and when these are not available the time of the red gum honey flow is suitable for getting new combs drawn out from full sheets of foundation. Comb foundation is expensive, but in the end combs built from starters are more expensive still, because so much drone comb is built when starters only are given, that one of the principal advantages of the frame-hive system is lost.

All frames should be wired, four horizontal wires being most in favour with beekeepers; the wires should be well embedded into the foundation so that it may not come away from them. Between the bottom edge of the sheet of foundation and the bottom bar of the frame there should be a space of at least ¼-inch, to allow for the expansion of the sheet by the heat of the hive.

The best combs are obtained when the foundation is drawn out by the bees in the super immediately over the brood nest without an intervening excluder.

Combs should be capped at least two-thirds before being extracted, so that the honey will be of good density. When hives are run three stories high, as indicated above, there is no necessity to extract all the honey at one time; one set of combs can be extracted, and the empty combs returned to the hive, and when they are partly filled again the others can be taken. In this way the bees are not upset so much as when all the combs are wet and sticky after extracting, and the risk of leaving the hive destitute of stores is avoided should the honey flow suddenly cease.

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APRICOT GROWING IN VICTORIA.

By W. H. Nicholls, Orchard Supervisor.

I.—Introduction.

The native country of the apricot is unknown. It is found wild in places remote from each other, but whether introduced there or whether indigenous to all, is a matter we are entirely ignorant of. Armenia is said by some authorities to be its country of origin, a circumstance that led Linneas to name this species of *Prunus*—"*Armenica.*" Lamark in "Illustrations des Genres" has founded a genus under the title "*Armeniaca*" and called the apricot "*Armeniaca vulgaris.*" The apricot appears to have found its way into Italy, and probably from there was brought to Britain some time prior to 1562, as Turner in his "Herbal" mentions that in that year it was being cultivated in England. Again, Haklayt asserts that it was brought into England by Woolfe, a French priest, and gardener to Henry VIII.

Like its near ally, the peach, the apricot is evidently a native of a hot country, and though large areas are devoted to apricots in different parts of Victoria, a warm district is required to bring the fruit to perfection. Apricots are grown in various situations and soils, and the stocks best suited for the varying conditions require careful consideration. This is a matter that will be discussed later.

Unlike peaches, the picking season for apricots is short. Most varieties ripen within a few days of each other, the whole season extending over only three or four weeks, whereas there is a succession of varieties of peaches from December to April. The short season and the uneven ripening of the fruit necessitate a large number of pickers at harvest time. Another difficulty is that seasonal conditions sometimes so interfere with the development of the fruits that the ripening of the early varieties is delayed, with the consequence that they come in with the main crop.

The "commercial" life of the apricot tree is much longer than that of the peach. Perhaps no other tree so lends itself to "rejuvenation processes," and by judicious pruning and feeding, trees may be made revenue producers even after they have reached the age of forty years, and there are in Victoria apricot trees fifty years old still bearing fine crops of saleable fruit.

In this State some four thousand acres are devoted to this fruit. A great deal of this area has been planted during the last five or six years, the greatest increase being in the northern districts. With the increasing facilities for processing and the many ways in which apricots may be used, it should be only a matter of organization amongst growers to find a market for this variety of fruit which has so much to commend it.

Moorpark Apricot Tree (35 years old) on Plum Stock, Growing at Lancaster, Victoria.

II.—Soils and Stocks.

Apricot trees thrive better on fairly heavy soils than on light ones. They require more moisture than peach trees, and soon show signs of distress if there is a lack of it at any time of the year.

It is essential to select stocks to suit the soil. If the soil be on the light side, peach stocks (which give quicker growth and earlier fruiting) should be used. Such stocks are obtained by sowing stones of a good yellow-fleshed, free-stone variety. The following method will be found the most satisfactory to obtain a strike of even stocks:—Make a composition of three parts sandy loam and one of short, well-decayed stable manure; mix them well, and place a layer about 2 inches thick on the bottom of a box (or pit if in the open) and sow a layer of stones on it. On these put another 2-inch layer of the composition and on this sow a further lot of stones, and so on until the box or pit is filled. Each lot of stones should be sprinkled with water, and an even temperature should be maintained throughout the germinating period. Usually from two to three weeks will elapse before the shells open.

It is always a good plan to get the stones planted out before the growth actually appears. A piece of well worked fallow is found most suitable for planting out these "started" stones, so that freedom from weeds may be ensured. The rows should be 3 ft. 6 in. apart, the stones sown about 3 inches deep, and from 4 to 6 inches apart in the drill, and covered with a nice light sandy loam. This sowing should take place not later than the end of August, to ensure strong vigorous seedlings fit for budding in February or March.

Ouillin's Early Apricot Tree (35 years old) on Plum Stock.

If the soil be a rich heavy loam with good natural drainage, the apricot on its own root makes a splendid tree. The method of raising the seedlings is exactly similar to that of obtaining the peach stocks just described.

For the heavier soils with a retentive subsoil, or, in fact, one might say for any soil with a retentive subsoil, plum stocks give the best results, but care must be taken to obtain stocks of a non-suckering variety. The *Myrobolan* stock is most favoured for the purpose. As a general rule these stocks are obtained from the planting of cuttings, which are taken in winter, and made from 12 to 15 inches long, and planted out in nursery rows in August. Although a percentage of them may be fit for budding purposes the following autumn, they are usually left until the next season, when good strong stocks will ensure robust trees. Stones of this plum are also obtainable in some places, and are treated similarly to those of the larger stone fruits.

A good deal has been heard of late years regarding the life of trees under irrigation, and there is no doubt that the question of suitable stocks is one of primary importance in all irrigation areas. When we consider the types of soils predominating in the Goulburn Valley, for instance, where irrigation is so extensively carried out, the natural deduction is that plum stocks will produce longer-lived trees than peach stocks.

Right through the Goulburn Valley frequent changes of soils in comparatively small areas are to be found. On blocks at Lancaster and Tongala as many as four distinct changes may be seen in some small orchards. The difficulties of the grower are thus increased, for if he decides to plant, say, a 20-acre block of stone fruits, he must select stocks according to the different changes of soil, if a uniform plantation is to be had. During the past season, it was noticed repeatedly that where the apricot was worked on plum stocks, good crops were obtained, and this in a dry season; in fact, one of drought. This denotes that the plum stock is a great "forager," and adapts itself to the necessity of having to "travel deep" for moisture during such a long dry spell as obtained during the winter and spring of last year.

On another block, apricots on their own roots, and apricots on plum stocks were growing side by side, and the result was practically no crop on the former and a good one on the latter. In this particular instance, the soil generally is of a rich sandy loam overlying a fairly retentive red clay subsoil. In another case the trees were on their own roots, planted in heavy grey buck-shot land of good depth, and they bore a fine crop; due, no doubt, to the moisture content of the soil in the early part of the growing season.

Still another instance may be quoted. Fourteen acres at Kyabram of rich, sandy loam, 11 inches deep, overlying a porous clay subsoil, beneath which is a yellow sandy wash, is given up to apricots grown on their own roots. It is one of the finest blocks of apricots in the Goulburn Valley, and has yielded many fine harvests. Last season the crop was very good, a result, no doubt, due to the fact that autumn ploughing and cultivation whenever practicable had conserved sufficient moisture to ensure plump buds and fruiting spurs, for unless moisture be present in the early stages of bud development, the buds become debilitated, and the subsequent setting of fruit is interfered with.

These instances all go to show the important part stocks play in the successful growing of apricots, and also show the necessity for careful cultivation of the soil. Care must be exercised in the application of water in irrigation districts, for an over-supply may so radically change the nature of the soil that the trees will be unable to perform their functions properly.

(*To be continued.*)

SOFT FRUITS STORAGE EXPERIMENTS.

Resumé of Preliminary Report by D. B. Adam, B.Agr. Sc., Department of Agriculture.

Experiments were conducted last season in the storage of soft fruits, when pears and peaches from the Goulburn Valley and from Doncaster, and plums, were stored under different conditions. The results have been satisfactory and promising.

Pears.

The pears—William Bon Chretien—were forwarded, on various dates, from several places between 30th January and the 28th February, so that, among other things, an estimate of the best time to pick was possible. A uniform system of packing in trays with wood-wool was used throughout, but some differences were made in the wrapping papers used.

RESULTS.

While there is little difference in the keeping qualities in cool store between early and later picked fruit over a three months' storage period, a very striking difference manifests itself soon after each lot of fruit is removed from storage, especially in that which has been kept at a low temperature. The earlier picked fruit turns black in the skin in patches over the whole area, but particularly about the stalk end. This has been termed " pear scald." The term, however, is perhaps in a way unfortunate, since " apple scald "—a well known cool storage trouble—is apparently quite different in its causation. The area immediately subjacent to the blackened areas remains firm, while the rest of the pear softens, as in the ordinary course of ripening; indeed, this blackening does not manifest itself until. other areas in the pear begin to soften. This accounts for its more rapid appearance after removal of the fruit from cool storage, when the rate of softening is greatly accelerated. Secondly, pears plucked too early showed, after a four months' storage period, a rapid break-down of the flesh. This contrasted with the comparative soundness, at that time, of fruit picked three weeks later—viz., on 24th February—which time proved the most satisfactory in every respect.

Of the various wrappers used, a single sulphite tissue paper gave the best results. In the actual cool storage process, however, unwrapped fruit possesses advantages—efficient cooling, &c.—but wilting is slightly worse, and on removal of the fruit from store its appearance is not so attractive as wrapped fruit. Pears picked at the correct maturity and placed in temperatures of 31 deg. to 32 deg. F. gave the most satisfactory results. There was no definite difference between fruit which had been stored in the air circulation chamber and that placed in the direct expansion chamber.

Pears gathered at the correct stage of maturity and stored at 32 deg. F. will, after a two months' storage period, remain sound and firm for ten days; indeed, the flavour and juiciness are not properly developed till four days subsequent to their removal from cool store.

COMMENTS ON RESULTS.

Possibly the point most clearly established in the experiments with William Bon Chretien pears was the fact that the best time to pick them for cool storage is a strictly limited one in any district. Those picked too early "scalded" or on removal broke down, and in any case did not develop the juicy aromatic lusciousness so characteristic of a good Williams pear. Those gathered too late seemed, in spite of a low temperature, to ripen too quickly. About Kyabram and Merrigum last year the best period for picking was roughly from the 14th to the 24th February. A second point of importance in pear storage established was the necessity for quickly reducing the temperature of the *fruit* to 32 deg. F. It is important to see that the pear flesh right to the core is reduced to this temperature. These two points are essentially, it is thought, the secret of successful commercial pear storage.

PACKAGES, ETC.

Naturally, these are designed to carry the fruit in the best possible manner, but in exporting pears on a commercial basis economic considerations and attractiveness would necessarily to some extent determine the method of packing. Shallow trays—18 in. x 14 in. x 3 in.—certainly guard the fruit against violence and consequent mould deterioration, and set it off attractively, but are expensive, and do not allow such an effective and rapid cooling of fruit when stacked in mass, as do some other packages. No definite expression on the question of trays and half cases for use for general export purposes can be made here, since the determining factors are largely economic. The packages preferably should not be lined with paper, and some wood-wool, though a minimum, ought to be used. Pears picked at the correct stage of maturity are so firm that with reasonable care in picking and handling losses from mould fungi would not be large. For local cool storage purposes the flat bushel case (unlined) is recommended. With these the storeman has a reasonably good chance of bringing the temperature down rapidly enough to store the fruit successfully for six or eight weeks on a commercial scale. Finally, it is a frequently expressed opinion that fruit from the south, about Melbourne, will keep better than that from the north—the Goulburn Valley. This may be so, but no evidence was obtained in favour of the idea last season. Perhaps in reality it is a question of the relative times each actually takes to get to cool store. The importance of reducing such time to a minimum has previously been emphasized. The best picking time for fruit grown south from the Dividing Range—at Doncaster—last year was a fortnight later than for that grown in orchards north of the Divide.

Peaches.

The varieties—Elberta, Late Red, and Early Crawford (from the Goulburn Valley), and the varieties Zerbe's No. 1, Belot's Late, Webb's Seedling, Catherine Ann, and Late Crawford from Doncaster—were experimented with last season. None of the varieties from the north stored well. Some of the southern varieties gave most encouraging results. Peaches in cold store generally deteriorate, for one of two reasons, viz., they become dry, spongy and flavourless, or they become mouldy. In a way, these troubles are mutually exclusive, since sponginess is a characteristic of immature fruit, and mouldiness one of fruit which is too ripe. However, with many varieties a middle way is possible—one in which the fruit is sufficiently mature to avoid sponginess developing, and firm enough not to be bruised if handled with reasonably good care. There is some reason to believe that the sponginess is not due to loss of moisture, but rather to changes causing gelation in the individual cells of the fruit.

Elbertas were obtained in two stages of ripeness. The earlier one was labelled "Sydney condition" and the other "Melbourne condition." The latter after three week's storage was the better of the two. Subsequent to this both lots of peaches became acid and disagreeable to taste. They also lost their juiciness. Of the other northern varieties received the Late Reds stored best, although they also became very acid after five weeks' storage. Early Crawfords were in such an advanced stage when received that they could not be stored at all. This instance emphasizes one of the great difficulties under which northern growers must necessarily labour if they wished to export this class of fruit. Indeed, to the writer it seems, in view of the fact that for best results peaches should be well matured on the tree, that this difficulty is an insurmountable one unless cool storage facilities are established in northern localities.

Webb's Seedling, a Doncaster peach, gave the most promising results in storage. After six weeks' storage the taste and juiciness were excellent, and remained so for eight weeks. Catherine Ann, another Doncaster seedling, also gave good results. The maximum storage life for the fruit to remain in prime condition was, however, slightly shorter than with Webb's Seedling. No fully matured specimens of Zerbe's No. 1, nor of Belot's Late, were obtained, so that, while giving evidence of being sound storage varieties, no actual confirmation of this was made. Late Crawfords appear to lose flavour, and are definitely unsuitable for periods of longer than four weeks' storage.

Picking at the correct time, it has been noted, is probably the most important factor in peach storage; but this "correct" time is a hard one to define, or even explain. Some varieties of peaches are characterized by a definite ridge which is the first area to become soft at ripening. Such a variety should be picked just when this area is going to commence to soften. Softening should be anticipated by a day as it were, though this condition should not be tested by pressure, but rather by the eye, the use of which for this work is soon acquired by experience. The stage at which to pick other varieties is more difficult to estimate correctly—experience alone can judge the time when the fruit is "going to commence to soften."

Having picked the peaches in this condition, it is very necessary to give the most careful attention to their handling, which should be the minimum required, and to its subsequent packing. Packing in trays is recommended. The fruit should be carefully graded both as to size and colour and the trays lined with wood-wool. The fruit should be wrapped in single tissue paper and well bedded in wood-wool, with some wood-wool between each of the peaches to keep them separate. Trays should be separate, and cleats should be nailed on to the ends of each when putting the lid on. Peaches sent overseas are a luxury to the recipients, who will be prepared to pay well for them. It can only be profitable to send the best fruit in the best condition as to grade and colour. The return will repay the most careful handling. When packed the fruit should be removed to cool store as rapidly as possible and the temperature reduced quickly. The storeman is greatly aided in an instance like this by the grower who packs his fruit when it is cool. Early morning is the best time, since the fruit has had time to cool down over-night. Experiments showed that 34 deg. to 35 deg. F. gave quite as satisfactory a storage product as did 32 deg. F. after six weeks' storage, and at this temperature there is less likelihood of freezing the fruit by its temperature falling too low. However, to store successfully at 34 deg. F. it is essential to see that the packages have been pre-cooled right throughout to this temperature. This is the duty of the land storeman. To do it thoroughly and rapidly he should store the trays at 32 deg. F., or perhaps lower, for the short time that the fruit is in his charge.

Finally, in selecting peaches for cool storage great care should be taken to see that the fruit is free from all trace of, or even liability to, infection from the brown rot fungus, *Sclerotinia cinerea* (Bon) Wor. The disease caused by this fungus, while it may hardly be visible when the fruit is stored, is one which spreads rapidly in cool store, where conditions generally are very favorable for its propagation.

Plums.

The varieties Diamond, President, Prince Inglebert, Pickering, Jefferson, and a green-gage plum, were stored. An attempt was made to differentiate results obtained from fruit stored at different maturities, but there was no appreciable difference in respect to a general softening and apparent dryness which progresses steadily with the time of storage. The softening is accompanied by wilting; subsequently moulds develop. The variety in itself as a factor, rather than any differences in treatment, seems to be the chief one governing the rate of this softening. Jefferson plums remained firm for two months, though the flavour was not so well developed as in the variety Prince Inglebert, which, however, became much softer after storage. The time of picking has a more decided effect on the flavour; the later picked varieties being superior in this respect. As a storage temperature 32 deg. F. is slightly better than 34 deg. F. None of the varieties stored gave a really first class product after eight weeks' storage.

PICKING, PACKING, ETC.

The experiments indicate that especial regard to the time of picking is not so important as with peaches, though they should not be picked too early, A "slightly acid taste" seems best to define this condition. Plums have been exported both in trays and in half cases. Results and reports from London agents indicate that only large attractive fruit, well packed and graded, can be profitably marketed in Britain. This, a necessarily limited trade, is best carried out with trays lightly lined with wood-wool, and by wrapping the fruit in a single tissue paper; a design thereon would greatly add to its attractiveness. The fruits need not be separated from one another as in the case of peaches.

Summary.

Experiments of a preliminary nature have been carried out with pears, peaches, and plums.

Success in pear shipments rests as greatly with the grower, who must pick his fruit carefully and at the correct maturity, cool it quickly and thoroughly, and remove it at this temperature to the ship's side, as with the ship's engineer, who has to keep it steadily at 32 deg. F., a deed not so difficult to accomplish if the grower and his agent see to their end of the business.

Williams pears grown at Kyabram kept in prime condition for two months, and subsequent to removal remained so for ten more days.

The best time to pick for long cool storage extended last year over the limited period, 14th to 24th February, with northern-grown fruit.

Several varieties of peaches were stored. Those grown at Doncaster gave the most satisfactory results.

The importance of picking at the correct maturity is emphasized.

Webb's Seedling—a Doncaster peach—gave the best results after storage. This variety remained sound for eight weeks.

Packing in trays with ample wood-wool and with great care is recommended.

After thoroughly pre-cooling the trays may be stored at 34° to 35° F.

It is important to see that fruit for cool storage is free from brown rot. Indeed, it is inadvisable to store fruit from trees on which any of the fruit has decayed from this trouble.

Jefferson plums stored for two months gave at that time the firmest product of a number of varieties tested. Prince Inglebert plums retained their flavour better than the other varieties.

For export purposes only large fruit, well graded and packed in trays, are really profitable to handle.

London advices show that attractiveness in packing, &c., is, with all soft fruits, of prime importance to successful and profitable selling.

There can be no doubt that Victoria can grow good quality fruit, but many of her growers have yet to learn the art and value of care in packing this fruit.

Acknowledgment.

The writer wishes to thank orchard supervisors and several growers for much assistance given with the experiments. Special mention should be made of Messrs. Nicholls and Krone, of the Orchard Supervision Branch, and Mr. Webb, of Doncaster; the last-named gentleman, besides supplying fruit, devoted considerable attention to work connected therewith.

HIDES AND SKINS.

DEFECTIVE METHODS OF CURING, ETC.

By J. C. Marshall, Stock Inspector.

Great monetary loss is annually caused by the present-day careless methods of flaying the skins of cattle and sheep, and by the excessive branding of cattle and calves Other causes which depreciate the value of hides are inefficient curing and the dirty and stained condition in which they are frequently marketed. Still another cause is the injuries sustained by the animal before reaching the slaughter-yard. About twenty-five per cent. of the lighter Victorian hides is damaged by cuts and score-marks received by the living animal through contact with barbed wire.

Local tanners and export buyers are naturally on the watch for imperfections. The defects in past purchases are uppermost in their minds, and where buyers are unable to make a full examination of hides and skins submitted for sale and simply buy on sample, a good margin for safety is usually left by them.

In addition to the hides and sheep skins treated in the tanneries of the several States, a very considerable export trade is maintained. The total value of those exported from Australia during the five years ended 30th June, 1923, was £13,913,093, made up as follows:—

Sheep skins with wool .	£9,263,125
Sheep skins without wool	899,674
Cattle hides	3,750,294
	£13,913,093
A yearly average of	£2,782,618

Large quantities of hides are imported into Australia mostly from New Zealand and the United Kingdom. The European hides imported are almost wholly heavyweights, being large and heavy, and of even substance without blemish. These are used mostly in the manufacture of belting for mining and machinery purposes. The value of the cattle hides imported~~for~~ the five years ended 30th June, 1923, was £2,161,888, a yearly average of £432,377.

Some Reasons for Bad Hides.

BAD FLAYING.

Seldom is a perfect hide presented. Hides direct from abattoirs, unsalted and in clean condition and of good shape, are frequently scored or cut. In some cases the scores may be concealed in such a fashion as to be detectable only later on in the tanning process Skins may be cut while the carcases are being dressed, and to use a common abattoir expression be " cut out." That is, if the damage be near the edge of the skin, the hole is cut to the edge. The result is an ill-shaped and jagged-edged hide.

In calf skins occasionally pieces of the felm or panniculus and muscle tissue are stuck over or placed on holes or cuts, and by this means an attempt is made to deceive the unwary buyer. These practices are well known in the hide and skin trade and the large discrepancy that the countryman notices between the selling price of his hides.

and what he pays for leather, is in no small degree attributable to the faults which have presented themselves to the tanner.

Farmers, station-owners and country butchers, supply about one-third of the hides and skins reaching the city skin stores, and it is all-important that they should arrive in the best possible condition, so that the tanner may get the greatest quantity of good leather from them. Country suppliers of the raw material are, as a rule, large users of leather goods for harness and general farm purposes, as well as for boots and shoes, so that both as a seller of hides, and as buyers of leather, they are directly affected, and doubly interested.

Country hides are for the most part ripped off carelessly, without regard to final shapeliness, and often very little attempt is made to cure them, or preserve them in any way.

Generally the farmer sells to dealers, who collect from all sources in the country districts and forward consignments to the city stores. Occasionally the dealer sells them in country centres where they are detained and later on consigned with others to a hide merchant. Thus it may happen that a considerable time will elapse before hides eventually reach the tanner. Owing to insufficient curing, country hides frequently arrive in a condition known as " slippy," and are more or less putrid, and very little good leather can be manufactured from them.

Damage by Branding.

The methods at present employed for identification of cattle are fire-branding and ear-marking. The fire-branding of cattle is the cause of a tremendous loss to the community generally and the producer in particular.

Mr. W. A. N. Robertson, Chief Veterinary Officer for Victoria, computes the loss on Australian hides due to the damage caused by the present methods of branding to be from 5s. to 7s. 6d. per hide or a total loss of half a million sterling to the stock-owners of Australia.

Unfortunately in fire-branding the marks are generally placed on that portion of the hide from which the best leather could be made, *i.e.*, the ribs or rump of the beast, and thus one or even two square feet of the most valuable part are rendered worthless for making into leather. The ribs and rump portion of the hide becomes, when manufactured into leather, mostly all butt. Butts really are sides of leather with the necks, shoulders, flanks and legs trimmed off. If fire-branding is a necessity, then as far as practicable the brands should be placed on the inferior parts of the hide, say on the neck, cheek, shoulder or flank.

The original calf brand may be comparatively small, but as the animal grows the brand is proportionately increased in size.

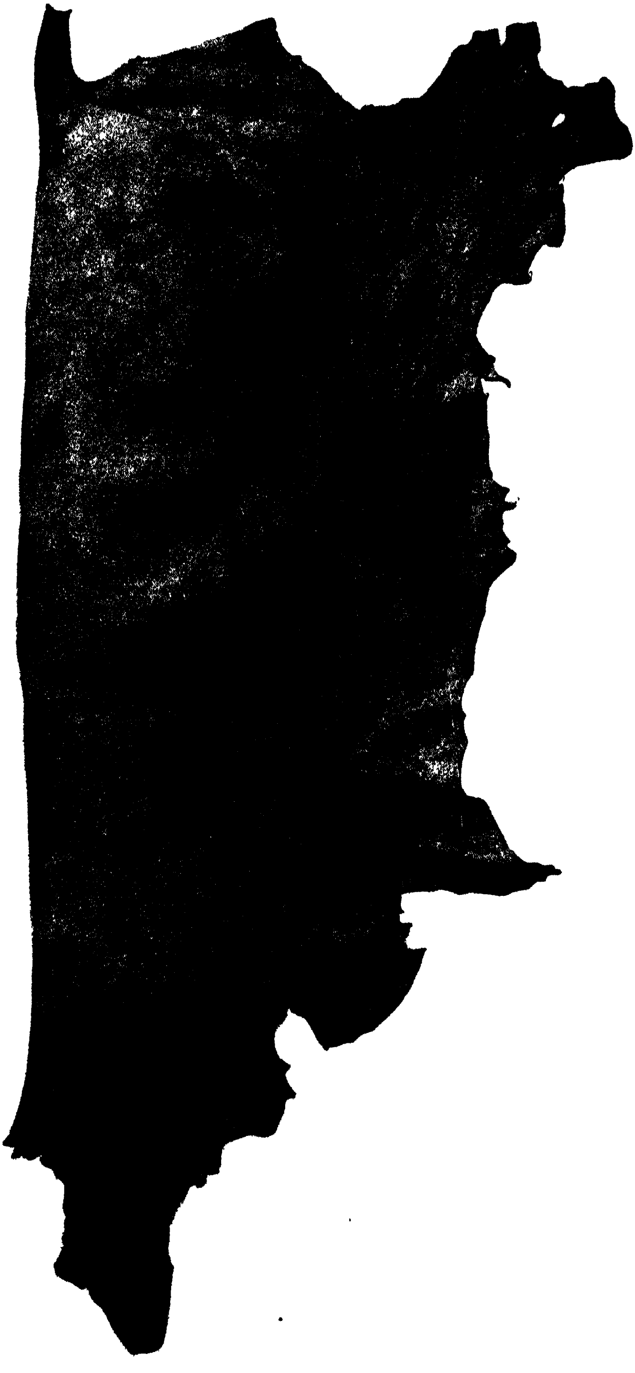
Fire brands are occasionally to be seen on both sides of a beast anywhere from neck to rump, and they may have so affected the hide as to be visible on the fleshy side.

METHOD OF SLAUGHTERING AND SKINNING.

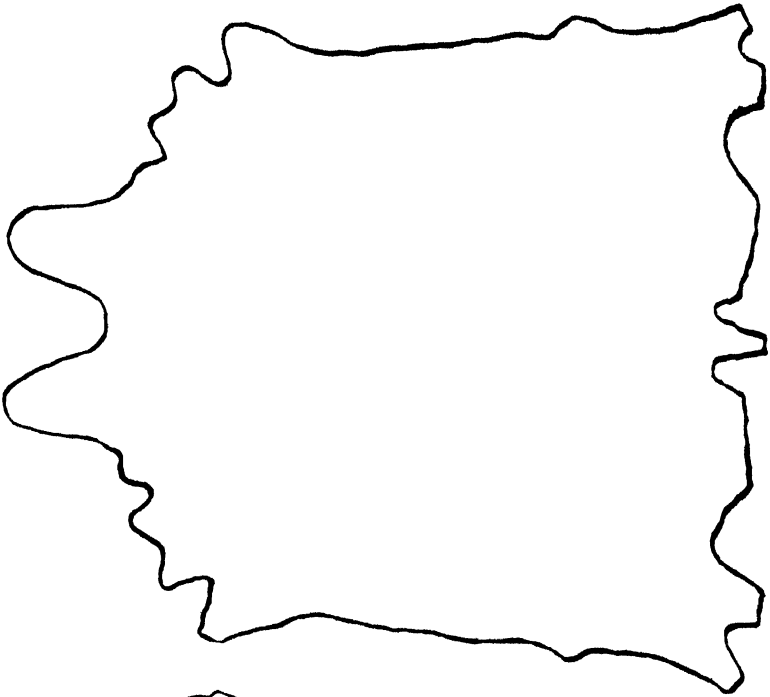
Cattle.

All animals before slaughter should be thoroughly cooled down and given access to water. Thirsty animals, and those that have been rushed about and slaughtered while hot, are difficult to skin, and cuts, scores and nicks are almost sure to result.

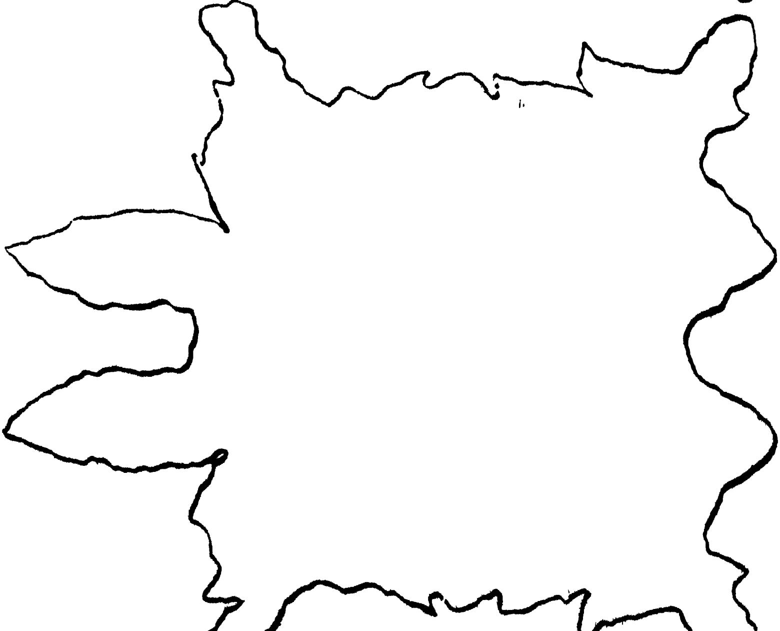
Result of Good Flaying.



Result of Bad Flaying.

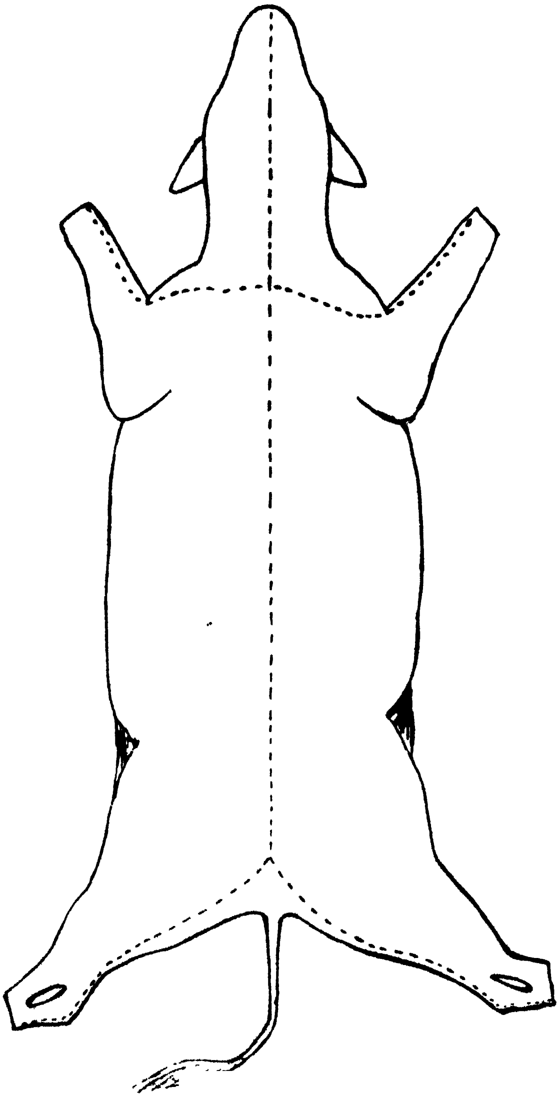


Shape of a Well-flayed Hide.



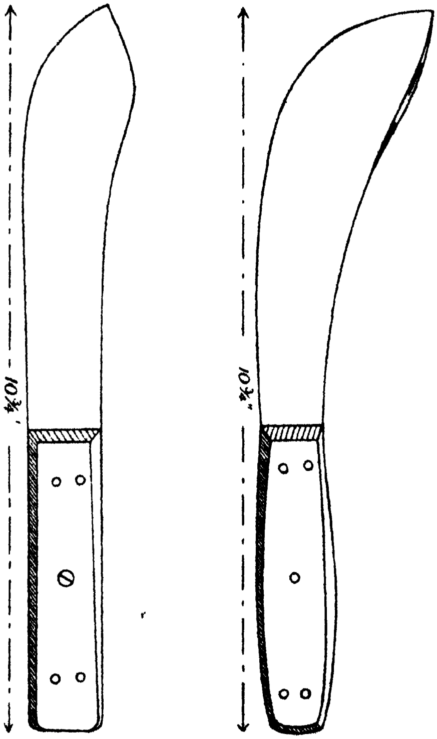
Shape of a Badly-flayed Hide.

It, of course, goes without saying that the animal should be skinned immediately the kick is out of it after sticking, and by no means allowed to get cold before a commencement is made. If skinned immediately, the hide will come away freely.



The dotted lines indicate the direction to be followed with knife in order to get the best shaped hide.
(Figure is of a beast on its back.)

The tools required for the slaughtering operation on farms are two knives, a steel, an American axe, and a saw (either butcher's or carpenter's saw will do). A good straight six or seven-inch bladed ripping-knife for skinning and ripping, and a slightly curved bladed knife for siding and backing-off are also necessary. The animal should be cleaned free of dirt and manure, and when it is killed the carcass should be brought to a clean place on which to be dressed. After the beast has been felled, either by pithing or by giving it a sudden blow on the forehead, it should be bled. This is accomplished by making a deep incision into the neck. Then a long straight incision must be made from a point half-way between the breast-bone or sternum and throat, severing the skin along the median line for from 9 inches to 1 foot. The wind-pipe will be then exposed; this must be followed down towards the brisket point with the knife, keeping in deep, with the back of the knife on the wind-pipe until the big blood vessels are encountered where they fork, and at that point the artery and large vein may be severed.



No. 1. No. 2.

No. 1.—Knife for pithing, sticking, and opening out the skin from legs, etc.

No. 2.—Class of knife known as a siding knife, and used for making the longer cuts, etc., and strokes in siding and backing off. The siding knife is used mostly on cattle and big calves.

For dressing small calves and sheep two good knives like No. 1 will suffice.

If a good stick be made, the animal will bleed remarkably well and quickly. In the case of cattle the neck should never be cut cross-wise. When the carcass has bled freely, the head, cheeks and face should be skinned, and the chin split by extending the " coming-up cut " to the one made in sticking. The horns should be sown off and the head removed and the neck " scragged."

The beast must then be placed on its back and held in position by means of a short prop known to the trade as a " pritch," or else by placing a block on each side of the carcass. The legs may be cut off at the knee joints and hocks. The skin may be opened at the knee joints and the knife run in a direct line to the brisket, and in the case of the hind legs from the hock to a point about three inches behind the cod (purse). Next the hide may be opened up from the crutch to the sticking cut in the neck.

The actual skinning process then commences. One of the main factors in flaying well, is to hold the hide up tightly with one hand and drive or thrust the knife with the other, cutting from heel to point. After opening the carcass out on the ground and skinning well down each side, the brisket and aitch are sawn through. It must then be partly raised from the ground by means of the tackle until the tail is about as high as the operator's shoulders. The tail should be removed and about six inches of tail-skin left on the hide. Then proceed to remove or clear the bulk of the hide. Finish around the butts and side to the chine or back bone on each side before completely raising the animal. (The beast is sufficiently raised when neck is just clear of the floor). After removing entrails and chest contents, chop or saw down evenly through the middle of the back-bone from pelvis to neck and wipe the carcass with a clean damp cloth. To do the best work, good tools are required. Proper knives are essential.

Country hides forwarded to market are at present much inferior to those sent by butchers and from abattoirs. At abattoirs only experts are engaged in the flaying process; further, the abattoirs have one advantage in that hides are cleanly handled there and quickly marketed. From the bulk of the metropolitan abattoirs the hides are taken fresh daily, and the curing process, if required, done at the hide and skin stores by qualified men; or else they are sold direct to metropolitan tanners and subjected to the tanning process forthwith. But all the blame for damaged hides must not be assigned to farmers and country butchers. Hides coming from abattoirs often shown signs of scoring or nicking, together with cuts and "cut outs." Expert butchers, of course, can take off the hides perfectly, but the work as done at present being mostly in the form of rush-work, the necessary time cannot be given to perfect flaying.

The method of flaying cattle-hides as conducted at abattoirs lends itself to scoring (partly cutting through the hide). In the process of "grounding" the bullock, a considerable portion of the work is accomplished while the beast is on its back, and while in this position the hide is almost completely taken off the carcass. It is around the region of the buttocks, rump and tail that damage is effected while the beast is on the ground. Most butchers like to "side" the animal and carry the work right around the buttock and even clear to the tail while it is on the ground. The work can be more quickly done while the animal is in this position, but it is often accomplished at the expense of the hide, for it is there that a good deal of nicking and scoring takes place. The work round this part would be done better, as far as the nide is concerned, when the beast is partly hoisted; although the carcass would not be so quickly dressed, the hide would get better treatment and the beef look and be dressed just as well. It may take a little longer time, but in these days when wages for expert slaughtermen are high, time to most butchers is of more value than the loss due to the damage that may be inflicted on the hides.

The treatment by country butchers of the tail end of the beast is frequently at fault. Instead of skinning the tail carefully and well down from the rump to within about 6 inches of the tip, it is often severed back into the rump with all its skin intact. No doubt it keeps fresher looking, and sells better for edible purposes with the skin on, but at what loss! At the expense of the ultimate shape of the hide; for the tanner has to sacrifice some of the most valuable portion of the butt to even up the hole made as the result of cutting off the tail too close.

Country butchers' hides are at times better flayed than those from abattoirs, although improvement can be effected in their flaying. As a rule, however, these hides are not so well cured and are frequently found dirty (carrying dirt, blood, manure, &c.) on reaching the city hide and skin stores.

Method of Opening to Produce Square Hide.

To the abattoir operative and country butcher, little may be said as to the proper method of opening up the carcass to get the best result in the hide as to shape, but the farmer and station-owner require to better their present methods. There is room for improvement in curing also.

In this Journal for June, 1917, attention was drawn to the necessity for changing careless methods. Unshapely hides and skins with ragged edges which occasionally arrive at city stores in a dirty and putrid condition spell loss to the producer. What should be aimed at is to get the hide from the beast as nearly square as possible, so that the tanner may get the maximum amount of leather with the minimum of loss especially in the way of trimming.

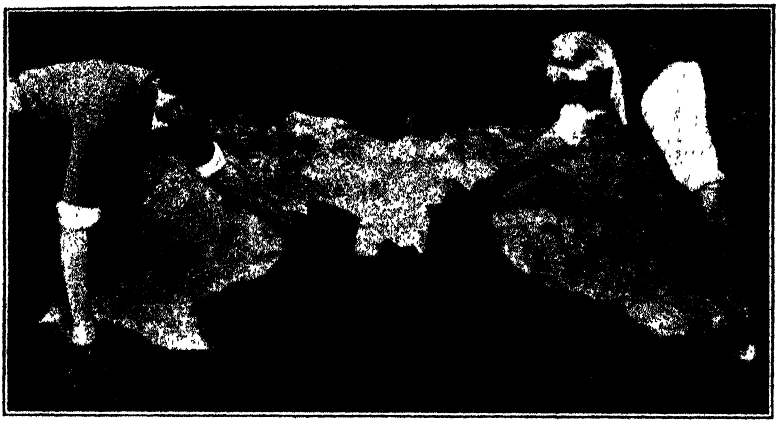
CALF SKINNING.

The animal may be either stunned or "pithed" before sticking. In some cases the head is completely removed as soon as the beast is felled. While the carcass is bleeding the ends of the clotted veins and arteries of the neck may be cut once or twice so as to allow the blood to flow more freely. In calf-skinning, it is not necessary to knife off the hide to the same extent as with large cattle. The smaller the calf the less knifing is required. The operation is begun by opening up the legs as in the adult beast, and the skin is, wherever possible, punched off by the fists or by the back of the knife. The knife is necessary to clear the neck and around the legs and flanks and near the base of the

Siding Down.

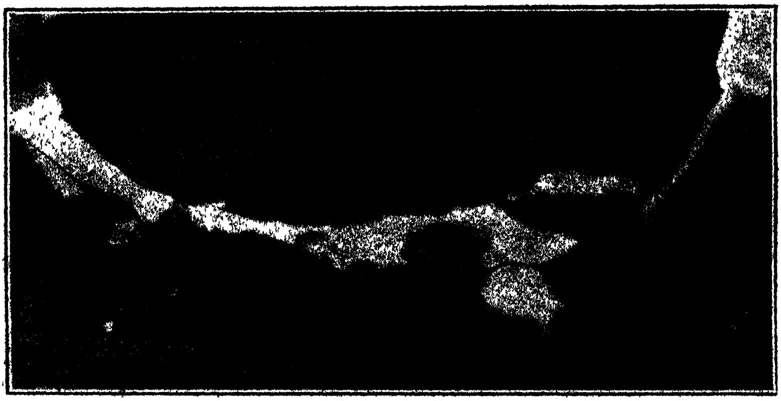
Note way knife and hide are held.

HOW TO FOLD A HIDE.



First Stage.

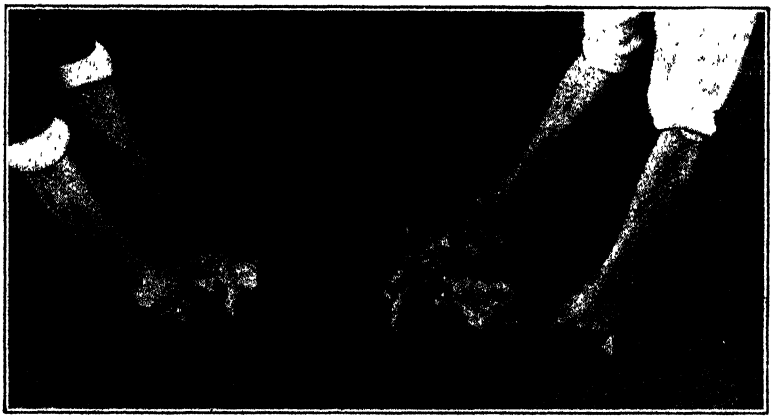
Second Stage.



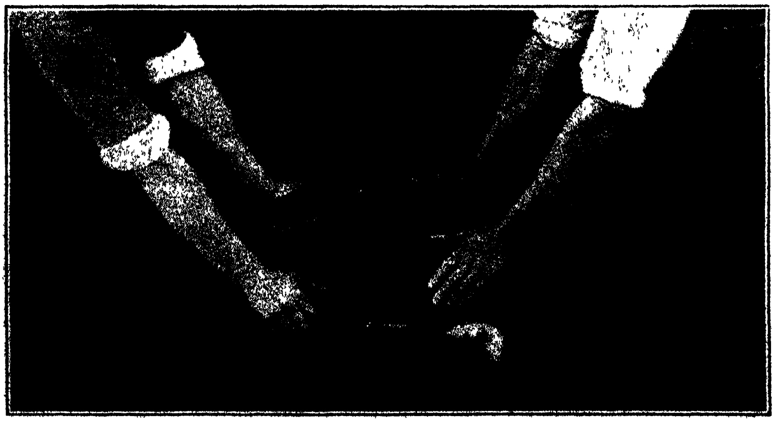
Third Stage.

HOW TO FOLD A HIDE.

Fourth Stage.



Fifth Stage.



Sixth Stage.

tail, but the balance may be pulled, and in this way the chances of nicking are minimized. Calf skins score very easily, and by using the knife as little as possible a more valuable skin is almost sure to be obtained.

DRESSING SHEEP.

In the country, sheep and lambs are usually held over a rail on the floor, and stuck alongside the ear, either by pushing the knife right through the skin on both sides of the neck and then turning the knife while in the neck and cutting backwards to the bone, almost severing the head. At abattoirs and country slaughter-houses variations of this method are adopted.

The sheep or lamb is then placed on its back with the four legs turned upwards, and the operator " legs " the animal, that is, he grasps the off fore-leg between his knees and from the knee joint rips down to the neck. This is repeated with the other fore-leg, and little opening out is necessary. Before proceeding further he makes an incision in the neck to free the gullet, in which a knot is tied so that the contents may not escape. The piece of skin overhanging the brisket is next grasped in the left hand, and the right hand and arm pushed up under the brisket skin almost to the cod and forced each side in so doing. The hind-legs are grasped between the operator's knees and the skin ripped down from hock to crutch and opened out slightly. The handle of the knife may be used in forcing the skin away from the opening made in ripping to clear the legs near the tail. The gambrel should then be inserted between the hock joints and the animal ham string and hung on hook. The hook should be just high enough to allow the carcass to hang clear of the floor. An even cut should be made from cod to neck down the length of the skin and the skin " fisted off " wherever possible. A little knifing in the flanks and around the tail is all that is required, and if the animal is sappy, the skin will, when started right, peel off without much effort on the part of the killer.

CURING OF HIDES.

CATTLE.

The hide must be washed clean of blood, dirt, manure, or other *débris*, and allowed to cool. It should be laid out in a clean place and liberally and evenly sprinkled with coarse salt. The quantity necessary is about 12 lbs. per hide. The legs, neck, and edges of the hide require special attention, as they are the first to show the effects of bad salting. If the hide is to be disposed of at once, it should then be folded by throwing the sides over the centre, then the neck and tail end, again folded over, and rolled up into a bundle and tied with thin rope or stout twine. Wire should never be used, as it will eventually stain the hide. Efficient, clean and quick salting is necessary to prevent the hide from turning more or less putrid. Putrefaction causes the hair to fall or slip, and " slippy " hides are frequently not worth tanning.

If it is intended to store the hides to make one large consignment, they should be cleaned, and when the animal heat has escaped, placed in a large shallow concrete pit, the floor of which has been sprinkled with coarse salt. The hide should be laid in the pit fleshy side up and sprinkled evenly with clean coarse salt. The next hide may be laid on top of the previous one and salted similarly. In the pit the hides make their own brine and become better cured, and will stand a journey to market better than the fresh-salted ones. After being in the pit for a fortnight or longer they may be lifted out to drain. When in twenty-four hours they firm up, they can be rolled and bundled as previously described, and firmly tied with thin rope. Before bundling any superfluous salt should be shaken or swept off.

Another method of treating hides is to place them in pairs, fleshy sides together, after they have been well salted, when they may be bundled and allowed to cure.

If it is intended to keep skins on hand for any length of time, it will be necessary to spray or paint them with an arsenical preparation, in order to prevent the ravages of weevils or other vermin. A satisfactory spray can be made by adding 1 lb. arsenic and 3 lbs. soda to 5 gallons of water, and then boiling the mixture; when dissolved make up to 15 gallons of water. If preferred, arsenate of soda, procurable at most country stores, may be used in the strength of 1 lb. to 5 gallons of water; another preparation can be made in the following way:—Dissolve 1 lb. arsenate of soda in five gallons of cold water; place 1 lb. bitter aloes in 2 gallons of water and boil until the aloes are properly dissolved, and add one pint of the aloes mixture to every five gallons of the arsenate of soda mixture. The spray is then ready for use.

Any preparation should, of course, be painted on the fleshy side of the skin.

CALVES.

Calf skins may be treated and folded in the same way as cattle hides. Two or three or more may be folded together to make a fair-sized bundle and tied firmly with strong twine or thin rope.

SHEEP.

Sheep skins immediately after removal from the carcass should be hung on rails or wire in a cool, draughty, shady place to dry. A large open or louvred shed makes a good drying place. They may be bundled together and sold or forwarded to market as soon as dry.

MARKETING OF HIDES.

Cleanliness is an important factor in obtaining top market values, and often a glance will show why some hides fetch only the lower prices. Dirty hides, due to the use of dirty salt, are too frequently in evidence.

If consignors improved their methods of branding, flaying and curing their hides and skins, city buyers would quickly recognise the fact and pay accordingly.

By the disposal on the farm to country dealers, the hides eventually lose their identity and the careful man is not compensated to the full extent for the care he may have exercised.

Hides and skins may be forwarded in large or small parcels to the various stores and sold on account of consignors. Such consignments should be properly tagged and addressed and information forwarded giving full particulars as to condition, &c., and they will be graded on the consignor's behalf and for sale as described.

Clean, well-cured, good-shaped hides and skins free from scores, cuts, blemishes and slip, will fetch top values. At the stores facilities are given buyers to thoroughly inspect each separate hide if necessary prior to the sale.

THE CITRUS INDUSTRY IN SPAIN.

METHOD OF PACKING.

The following observations on Orange Packing in Spain have been received by the Citriculturist of the Department of Agriculture from Mr. W. Jones-Allen, who is associated with the Airless Storage Company, and who has had a large experience in fruit-marketing in Great Britain and on the Continent.—

The citrus-growing districts of Spain are mostly situated on the east coast of that country, between Barcelona and Malaga. The chief centres for the export of fruit from these districts are Barcelona, Valencia, Burirana and Castellon. From Barcelona to Valencia is a distance of between 80 to 100 miles, and throughout the train journey it is one long line of citrus-growing land, in fact it might be said that it is one vast citrus grove.

In 1920 some 10,000,000 cases of oranges, averaging about 500 oranges to the case, were shipped to London for the European markets; this was exclusive of the fruit shipped by train through France. The main variety of oranges grown in this district is naturally the Valencia, the orange deriving its name from the Province of Valencia. The method of growing is the same to-day as it was when originally laid out. The land is a red sandy-loam, the trees are somewhat larger than those of Australia, but the method of growing, irrigating and culture is very much like that now obtaining in Australia; in fact some of the districts remind one very much of Australia. The method of irrigating was originated by the Moors during their occupancy of Spain nearly a thousand years ago. The hills in the back ground provide the gravitation; the water is thus directed to the various districts, and then by very crude channels to the respective orchards. In some places where the country is hilly the land is terraced, and looks very much like a series of platforms on the side of the hills.

The growers, except in isolated cases, do not pack their own fruit; the packers are really merchants, who buy the fruit on the trees and have their own pickers and packers and packing houses. Very crude methods are adopted for transporting the fruit from the orchard to the packing houses, mostly by means of donkeys loaded pannier-fashion. The fruit is then laid out on the floor of the packing house, sometimes four and five feet deep on a layer of straw or hay on the floor of the packing house. According to the state of the weather at the time of picking, the fruit is allowed to sweat from six to fourteen days. It is then hand-graded by women labour, sorted in the respective grades, wrapped and packed. The method of packing is invariably of the square-pack type. This allows for a current of air around every orange. The packing case has a central division or sometimes two, raised in the shape of a half circle, from three-quarters to one inch higher than the ends of the case. The fruit is packed up on a level to this bulge, so to speak, the lids are nailed at the centre first and then pressed down and nailed at the two ends. This gives a tight pack and allows for shrinkage, as occurs always in the case of citrus.

The two essentials recognised by all packers in Spain are tightness of pack and air circulation. The packing sheds are in some cases very crude and in others very elaborate, depending largely upon the districts in which they are situated, but the method of packing in all is practically the same. So highly skilled have the packers become that the marks on the packs in London denotes how many oranges there are in a case, and this never varies, in fact when the case arrives in the various distributing centres in Great Britain, buyers in the country often do not come to inspect, as they know the packers' marks being sold and will buy them on the name only. This would be a highly satisfactory condition of affairs applied to export packing from Australia, and it would pay the various Associations to concentrate on this highly desirable result.

During a recent visit to California it was observed that the method of packing there is somewhat different from the Spanish; it is the Floradora or diagonal pack. The method used in South Africa is as far as possible to pack with the bulge in the case, the same as the Spanish, and the good carrying of fruit from Africa to London has proved that this bulge has a great effect in retaining the rigidity of the pack by building up the bulge.

The Australian fruit wherever shown has been highly commended for its splendid colour and flavour. It is quite in order to say that the Australian Washington Navel orange is not surpassed in any part of the world.

The writer showed some Australian oranges in Durban and Cape Town and they were much admired. The colour is a great selling feature, and the Australian oranges seem to acquire this better than those of most other countries.

COST OF PACKING.

The extracts hereunder are made from a report received from Mr. W. Lambert White, of the British Consulate at Valencia, Spain, and a member of the firm of White Harker and Company, fruit exporters:

At par 25 pesetas = £1 sterling.
At present rate of exchange, 28 pesetas = £1 sterling.
1 kilo = approximately 2 1-5th lbs. avoirdupois.

Orange Wrapping Paper.

In Spain the paper is bought by the bale, which contains approximately 15,000 sheets of 20in. x 30in.

The best quality paper weighs about 165 lbs. to the bale.

The best quality paper used here is made at "Onteniente" by the factory "La Clarina."

The present prices (October, 1923), range from 140 to 145 pesetas per bale in Valencia.

These prices of course do not include printing the paper. Printing costs about 35 pesetas in one colour; about 50 pesetas for printing in gold; and about 75 pesetas for printing in gold and one colour.

At present there is a duty of 18 per cent. per 100 kilos on imported paper of this class.

WAGES IN THE ORCHARD.

Men, 5 pesetas per day. Women, 2.50 pesetas per day. Boys, 2.50 pesetas per day.

WAGES IN THE WAREHOUSE.

Female apprentices. From nothing onwards.
Female sorters, 2.15 pesetas per day.
Packers, 2.50 pesetas per day.
Overseer, 2.50 pesetas per day.
Wrappers, 2.25 pesetas per day.
Foreman in packing shed, 5.00 pesetas per day.
Male carpenters, 6.50 pesetas per day.
Male stringers (those that cord the boxes up), 5.00 pesetas per day.
Male carpenters, 6.50 pesetas per day.
Male stringers (those that cord the boxes up) 5.00 pesetas per day,
Male carriers, 4.50 pesetas per day.

The above are the wages that were current during the season 1921-1922.

There will probably be very little, if any, reduction for the present season.

Gross Weights Orange Cases.

		lbs.
420s.		130
420s.	Large	160
420s.	Extra large	180
714s.		180
1064s.		200

Half Cases.

		lbs.
200s.		70
200s.	Large	84
200s	Extra large	104
300s.		84
504s.		94

NAILS, &c.

Wire nails used in packing are from 15 to 20 gauge. Price per package is from .90 peseta to 1.40 pesetas. (Packages contain approximately 100 nails.)

Wire, which is used by some packers for the fastening of cases, is bought at 115 pesetas per 220 lbs.

Tying cord is bought in bundles of 110 lbs. each. The prices vary according to quality, and ranges from 27 to 33.00 pesetas per bundle.

CASES.

Unfortunately in Spanish packing we do not work with one Standard size case, but have several different sizes.

Until recent years only large cases were shipped, viz: 420s., 714s., 1064s., but now nearly the whole of the trade have gone on to half-cases, which are packed viz: 200s., 300s., 360s., and 504s., oranges to the box.

Below are the measurements of the wood required for making some of sizes of Valencia packages. The end pieces and the centre pieces have a curved top and the measurements given are the outside measurements.

HALF-CASE ORANGES.

(Cost 1 peseta 95 cents)

200s. Large—

2 ends 10 $^{5}/_{8}$ in x 13 $^{3}/_{8}$ in., thickness $^{11}/_{16}$ in.
1 partition 11 $^{13}/_{16}$ in. x 13 $^{3}/_{8}$ in., thickness $^{11}/_{16}$ in.
2 sides 5 $^{1}/_{8}$ in. x 29 $^{15}/_{16}$ in., thickness $^{3}/_{8}$ in.
2 sides 4 $^{3}/_{4}$ in. x 29 $^{15}/_{16}$ in., thickness $^{3}/_{8}$ in.
4 tops and bottoms 2 $^{9}/_{16}$ in. x 31 $^{1}/_{8}$ in., thickness $^{5}/_{16}$ in.
2 tops and bottoms 6 $^{11}/_{16}$ in. x 31 $^{1}/_{8}$ in., thickness $^{5}/_{16}$ in.

504s Large—

2 ends 12 $^{3}/_{16}$ in. x 12 $^{5}/_{8}$ in., thickness $^{11}/_{16}$ in.
2 partitions 13 $^{3}/_{8}$ in. x 12 $^{5}/_{8}$ in., thickness $^{11}/_{16}$ in.
2 sides 5 $^{3}/_{4}$ in. x 31 $^{7}/_{8}$ in., thickness $^{3}/_{8}$ in.
2 sides 5 $^{5}/_{16}$ in. x 31 $^{7}/_{8}$ in., thickness $^{3}/_{8}$ in.
4 tops and bottoms 4 in. x 33 $^{1}/_{8}$ in., thickness $^{5}/_{16}$ in.
2 tops and bottoms 3 $^{9}/_{16}$ in. x 33 $^{1}/_{8}$ in , thickness $^{5}/_{16}$ in.

1064s.—

2 ends 14 $^{3}/_{16}$ in. x 17 $^{3}/_{8}$ in., thickness $^{3}/_{4}$ in.
2 partitions 15 $^{3}/_{4}$ in. x 17 $^{3}/_{8}$ in., thickness $^{3}/_{4}$ in.
2 sides 7 $^{7}/_{8}$ in. x 43 $^{5}/_{16}$ in., thickness $^{3}/_{8}$–$^{13}/_{32}$ in.
2 sides 5 $^{9}/_{16}$ in. x 43 $^{5}/_{16}$ in., thickness $^{3}/_{8}$–$^{13}/_{32}$ in.
2 tops and bottoms 8 in. x 44 $^{1}/_{8}$ in., thickness $^{5}/_{16}$ in.
4 tops and bottoms 4 in. x 44 $^{1}/_{8}$ in., thickness $^{5}/_{16}$ in.

PACKING.

As a rule in the packing house they work in what is known as a "cuadrilla" or gang, and a gang for making 30 half-cases a day would consist of the following:—

Two women, who actually put the oranges in the cases.
Four women, who wrap the oranges.
Two women, who classify the oranges, and one small girl, who is an assistant.

In order to keep these women supplied with sufficient fruit for packing the 30 half-cases they would require the following:—

Three men to pick the oranges.
One foreman.
One man (with horse and cart) to take the oranges from the orchards to the packing sheds.

In addition to the above they would of course require one carpenter.

During the first season when there has to be more care taken in the packing of oranges, one man can pick only about 20 arrobas (approximately 560 lbs. per day).

The average weight of oranges that goes into each half-case is four arrobas (1 cwt), or for every 2,000 oranges one can pack about five half-cases.

SHADE-GROWN CIGAR LEAF.

The following report on the methods of growing and curing cigar wrapper leaf in Florida has been received from Mr. Temple A. J. Smith, Tobacco Expert of the Department of Agriculture, who some time since went to the United States to inquire into and report upon the methods of tobacco-growing there:—

This industry has reached large proportions in Florida; and is designed to produce cigar wrapper leaf of the Sumatra type. In order to make growing conditions as similar as possible to those of Sumatra, hundreds of acres are closed in with a frame work of wood and wires, over which cheese-cloth is placed. In some cases slats only, placed one inch apart are put on the top so that more sunshine may be admitted and thus a stronger type of leaf produced. The structure is 9 feet high, and the crop, when matured, reaches to the roof. The cheese-cloth covering lasts only two years, and the cost of growing tobacco leaf under these conditions is considerable, being variously estimated at from £80 to £130 per acre.

The average yield is 1,200 lbs. per acre, but the risk from damage by storms is very great, and diseases are causing much loss and anxiety to growers. Recently a disease, known as Black Shank, has thrown many fields out of use, in some cases in the second season after the erection of the shade structure. This disease is spread by the use of infected seed, and no cure has yet been found. Dr. Tisdale, Plant Pathologist for the Government, is investigating the disease, and considers that, by selection, and probably by cross breeding, resistant types may be found. An inspection of his experimental yields suggests that his efforts in this direction seem likely to be crowned with success, as some of his plants have certainly defied the disease while surrounded by plants badly affected.

Dr. Tisdale has had some experience with Blue Mould, in America, and he advised me to try selection of resistant plants to reduce the risks caused by this trouble.

Shade-grown leaf is best suited by a fairly rich, sandy loam soil, which must be well drained and heavily fertilized with a complete fertilizer in the proportion of 8 per cent. phosphoric acid, 4 per cent. potash, and 4 per cent. nitrogen. The plants are put out in rows by hand. In most cases the distance between the rows is from 4 feet to 4 ft. 6 in., and in the rows the plants are placed 18 inches apart.

The land is cultivated every week until the crop is too large to admit machinery, and, as it grows, the leaves have to be tied up to the roof to prevent their falling, owing to the soft nature of the stalks grown under such conditions. One man is not expected to undertake more than an acre of this tobacco. The growth of the crop is very fast, and from the time of transplanting takes from seventy to ninety days to mature. Many pests, such as the Flea Beetle, Bud Worm, and Horn Worm, have to be contended with. To guard against these, the crop must be sprayed or powdered every two or three days.

When harvested, the leaves are picked singly and taken straight to the barns and strung on twine, and hang-sticks at the rate of thirty leaves per stick of 4 feet in length, and hung on tiers in the barns, where the leaf is cured in three or four weeks. The only artificial heat used is charcoal fires on the floors during excessively wet weather.

After curing is finished, the leaf is packed in boxes and sent to the warehouses to be fermented and graded for market. Most of the larger growers, and companies for whom the crop is grown, have large buildings where the fermentation is done; in these the requisite degree of moisture and temperature can be controlled. The leaf is built up in stacks or bulks of from 2,000 to 4,000 lbs. each, and covered with heavy cloths, and in each bulk is a thermometer which can be examined from time to time. Fermentation may take from three to four weeks, as each bulk is liable to ferment three or four times and is turned and rebuilt when the temperature rises to between 115° and 130° F., according to the type of leaf being treated. Heavy-bodied leaf will stand higher temperatures than light, thin leaf. When fermentation ceases the tobacco, is graded and packed in bales of 100 lbs. each, and can then be sent to market.

The average price over ten years for this class of tobacco has been 2s. per lb., and it is difficult to understand why growers continue to take the risks the crop entails for such a poor return, many growers to whom I applied for information told me that if they were not able to have much of the work carried out by their families they could not carry on. Negro labour is fairly cheap, the wage of a man being 5s. per day, and that for women and children still less.

Buildings for this crop cost much money. Barns must be roomy and well closed in. Houses must be provided for employees, and warehouses for fermentation. The estimates given me for establishing a plantation and all necessary buildings, &c., were from £600 to £800 per acre.

The outlook for shade-grown leaf is not good at present, as cigar smoking is not keeping pace with the cigarette and pipe, and it is doubtful whether Australians should attempt to grow leaf under those conditions, at least until prices improve.

A heavy tax is placed upon Sumatra leaf coming into the United States of America, in order to protect growers of Florida leaf, but the cheaper labour and better natural conditions in Sumatra enable growers there to still enter the market here and make better profits than the local producer.

After the termination of the war high prices were paid for Florida cigar-wrapper leaf, and growers who then established plantations have gone on growing from year to year in the hope that prices would again become remunerative, but they are now giving their attention to the production of cigarette tobacco in which the prospects are better.

THE COTTON INDUSTRY IN AMERICA.

The following notes on the Cotton Industry in the province of Greenwood, South Carolina, were made by Mr. Temple A. J. Smith, of the Department of Agriculture, while pursuing his investigations in America in regard to methods of tobacco growing:—

This particular district is known as one of the oldest and best for cotton production in America. I am at present staying with a Mr. W. G. Moore, a large grower, whose family has been raising cotton in this portion of South Carolina since the inception of cotton growing. Mr. Moore has followed the vicissitudes of the industry carefully, and I am fortunate in being able to get information at first-hand from one so experienced and well-informed upon this important subject. I have met many other leading growers, and find all agree in respect to the matter I am now sending you. I have also inspected one of the large cotton mills here, and have talked with several men interested in cotton manufacture.

Just now the growers are experiencing a very bad time owing largely to the attacks of the Boll weevil, which has found its way into this quarter during the last two years, and which has been so destructive as to cause a reduction in area to less than half that of a few years ago, and at the same time a serious decrease in yield per acre. In 1914 Greenwood county produced 34,000 bales of cotton; in 1922, the same county produced only 6.000 bales, and for the falling off farmers do not hesitate to give the Boll weevil full credit.

These results have had a disastrous effect in other respects, one of which has been that the negroes who were growing cotton on the share system have left in large numbers for the northern States to work for wages, which will pay them better. No less than 54,000 have left this State since the 22nd of September of last year. This exodus of labour is not confined to Greenwood, but is general in about the same proportion from all the States in which the Boll weevil has operated. A corresponding slump has taken place in land values, and land in this county, which commanded a value of £12 per acre five years ago, is difficult to sell at £3 to-day. This condition is not hard to understand when it is explained that even where stringent measures are taken to combat the weevil by cultivation and poisoning, which naturally entails more labour and expense, the yield still falls much below that of pre-weevil years, as it appears impossible to absolutely prevent damage by the insect.

Unfortunately this evil is spreading and threatens to kill the cotton industry wherever it appears. Many of the old-established growers have already given up growing the crop, and the opinion here is generally expressed that only men with outside resources can keep on growing in the hope that some solution of the difficulty will be found. I have seen large areas abandoned for cotton, and farmers do not yet appear to have found other profitable uses to which to put the land. It may seem that I am taking too serious a view of the trouble, but I wish to make evident the need for every precaution to keep this pest out of Australia, as I feel sure that if it finds its way in, it will prove a grave menace to the cotton industry there.

The soils here most in favour for cotton are sandy grey loams of medium quality overlying yellow and red clay sub-soils, with good natural drainage. The red soils, which contain more clay, also produce cotton, but are later in maturing the crop, and not so desirable. The rainfall is from 50 to 60 inches per annum, of which about one-third falls during the growing season. Good farmers like to fallow the land a few months before the seeding season, which in this district extends from the beginning of April to the beginning of May.

Heavy fertilizing is the practice. About 400 lbs. of fertilizer made up in the following proportions is applied per acre:—3 per cent. sulphate of ammonia, 8 per cent. acid phosphate, and 3 per cent. potash; this is sown with the seed. The cost of fertilizing is approximately 25s. per acre. The land is laid off into rows 3 feet or 3½ feet apart, and a ridge thrown up about 7 inches high, in which the fertilizer is deposited and the seed is sown 1 to 2 inches deep, and from 1 ft. 6 in. to 2 feet in the rows. Shallow sowing is said to be best. When the plants attain a height of 7 or 8 inches the land is well worked with cultivators, and finally ploughed towards the rows of plants. When the plants form the square (which is the portion on which the buds come), if weevils are feared, each square is treated to a poison mixture made up by mixing 1 lb. of calcium arsenite with one gallon of water and one gallon of cheap molasses. This is applied by dipping a small mop (which can be easily made on the farm by tying hessian or tow on a short handle, say, 1 foot in length). The mop is dipped in the mixture and brushed on to the squares. Should rain wash this application off, the whole field must be gone over again, especially if Boll weevils are known to be present. Later, if weevils are still prevalent a dust gun is used to blow the powder on to the plant. The land is kept clean by cultivator and hand-hoes during the whole period of growth.

Picking commences early in September, and lasts till the end of October in this district. The average quantity picked per man is about 125 lbs. of seed cotton. It takes from 1,200 to 1,500 lbs. of seed cotton to make one bale of lint of 500 lbs., and a good crop will yield about this quantity, though the average now is nearer half a bale per acre. The cost of picking is 3s. per 100 lbs. of seed cotton, but most of the picking is done by families who grow the crop on the share system. After picking, the cotton is taken in sacks to the ginning plants, and after removal of the seed the lint is put in sacks ready for sale to the manufacturer. The cost of preparation is 16s. per bale.

The seed sells at from 4s. to 6s. per bushel of 30 lbs., and cotton at 1s. 3d. per lb., at which prices the grower is facing a losing proposition. The usual wage for labour is £6 per month, but very little cotton is grown on the wage system. Negroes and their families grow on shares. The area usually undertaken by one man is from 16 to 20 acres, and some assistance to hoe and pick the crop is required. Over 90 per cent. of the cotton produced is grown on the share system, the landlord providing the land, mules, houses, seed, and half the fertilizer; he also, in most cases, provides rations for his negroes, which, however, are paid for out of the tenant's share of the crop. The tenant does all the work of ploughing and cultivation, undertakes the general care of the crop, and pays his share of the cost of fertilizers, and landlord and tenant each take half the proceeds. In some cases the land is let to a tenant who pays one-fourth of the crop as rent.

The amount of seed sown here is 1 bushel per acre, and the favourite variety is Cleveland Big Boll, which is said to be an early ripener and good yielder. There is also a variety known as Dixie Wilt Resistant, which, it is claimed, is not affected by wilt.

People interested in cotton culture predict a short crop in the States this season, and, so far as I can learn, Texas is making a better crop than any of the others. The season in many places has been unsuitable. Present prices are not sufficient to tempt growers to plant larger areas, and it is freely stated that any price under 1s. 3d. per lb. will not leave a margin of profit to farmer. Labour is difficult to obtain, and altogether the outlook in this State for cotton culture is certainly not good.

POULTRY FEEDING TESTS.

By W. C. Rugg and W. O. Pederick.

The following are the particulars of feed tests now being conducted at the State Research Farm, Werribee. They commenced 1st April, 1923, and will conclude 31st March, 1924.

For the purpose of the tests 108 white Leghorn pullets were selected and divided into three pens of 36 birds each. None of those chosen was bred from a single mating, the object being to test only birds of such quality as may be found in an ordinary farm flock. All are housed and treated in exactly the same way except for the feed given.

No. 1—Free Choice Pen.—These birds have all the foods in different hoppers always available, and a wire basket is kept filled with green stuff.

No. 2—Dry Mash Pen.—There is a dry mash hopper always open in this pen. Chaffed green stuff is fed to these birds at midday and grain in the litter at night.

No. 3—Wet Mash Pen.—The birds are fed with a wet mash in the morning; chaffed green stuff is given at midday, and grain is fed in the litter at night.

The total quantities of food consumed, and the number of eggs laid by each pen, is set out below. A detailed statement is given on the next page.

Pen.	Mash	Grain.	Total.	Number of Eggs.
	lbs	lbs	lbs	
Free Choice	308½	1,245¾	1,554¼	3,586
Dry Mash	538¾	1,040½	1,579¼	3,386
Wet Mash	642	953½	1,595½	3,545

Details of Food Consumed and Eggs Laid.

Pen.	Month.	Bran.	Pollard.	Oaten Pollard.	Barley Pollard	Meat Meal	Rape Seed Meal	Oats	Wheat	Barley.	Maize.	Eggs.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs	lbs	lbs.	lbs.	lbs
Free Choice	April	12	25	½	½	..	..	41¼	72	24¾	17	419
,,	May	13¼	20	¼	½	..	..	32¼	96¾	21¾	26½	329
,,	June	11¾	9½	¼	2	2½	..	48	54	14	37½	292
,,	July	12¾	10¾	3½	..	11½	..	22¾	94	11¼	51¾	434
,,	August	14¾	9¾	9	1	8	2½	30¼	96¾	24¼	25¼	669
,,	September	16½	16½	12¾	3	5½	1	41¼	108½	25½	33¾	700
,,	October	23½	19¾	17¼	1¾	8	1½	50¼	103½	14	27	743
		104½	111¼	43½	8¾	35½	5	266	625½	135½	218¾	3.586
Dry Mash	April	14	23½	..	..	3¾	..	18½	83	18½	..	281
,,	May	13¾	23½	..	..	3½	..	22	108	22	..	287
,,	June	15¾	31¾	..	..	5¾	..	25	109	..	18½	230
,,	July	25¾	43½	..	..	10½	..	35	111	..	10	387
,,	August	34	57	..	..	11¾	2½	28	99	..	28	704
,,	September	33½	56½	..	..	9½	4	27	96	..	27	748
,,	October	37¼	61½	..	..	12¼	3¾	26	103	26	..	749
		174	297½	..	..	57	10¼	181½	709	66½	83½	3,386
Wet Mash	April	25	40	..	..	4½	..	19½	88	19½	..	398
,,	May	29½	49	..	..	10½	..	20	96	20	..	372
,,	June	30	48	..	..	13½	..	20	88	..	14½	256
,,	July	30	50	..	..	16	..	30	95	..	9	419
,,	August	32	52	..	..	20	..	25	90	..	25½	623
,,	September	27½	45½	..	..	20	..	26	92½	..	26	702
,,	October	27	54	..	..	18	..	24½	100	24½	..	775
		201	338½	..	..	102½	..	165	649½	64	75	3,545

OIDIUM OF THE VINE.

Uncinula Spiralis (Berkley & Cooke).

By Francois de Castella, Government Viticulturist, and C. C. Brittlebank, Vegetable Pathologist.

(Continued from page 685.)

Other Effects of Sulphuring.

In addition to its fungicide action on Oidium, sulphur acts in several other ways, some of which are highly advantageous and others distinctly the reverse. Chief among the former are a beneficial stimulating action on the vegetation of the vine; a marked effect on the blossom, resulting in an improved setting of the fruit; and earlier maturity of the grapes. On the other hand, sulphuring, unless judiciously applied, may lead to burning or scalding of the green vine tissues, to injury to the workmen's eyes, or to the development of a very undesirable taste in the resulting wine.

Beneficial Effect of Sulphuring.—It has long been recognised that, apart altogether from Oidium suppression, sulphur exerts a marked influence on vegetation: it seems to act as a tonic, increasing vigour and giving sulphured vines a darker green and more generally healthy appearance than those not so treated. Sixty years have elapsed since Marès wrote—

> Of all innovations in vine culture the methodical and periodical use of sulphur powder . . . is the most considerable that has yet been devised and accepted in practice. Its influence on vineyard yields is decisive. Up to the present it has had for result a considerable increase in production. Combined with thorough cultivation and manuring, vineyard yields have become both more regular and more abundant. The vegetation of sulphured vines is more brilliant; their fruiting is less exposed to the ravages of *couture.**
>
> Sulphur hastens ripening in a very remarkable way. Thus, since sulphuring has been adopted in Hérault,† the vintages have become much earlier. Previously they scarcely commenced before the 20th to 25th September. Since (sulphuring) they begin from the 1st to the 12th of the same month. . . .

Marès goes so far as to say—

> The advantages of sulphur application are such that its use in the vineyards would persist independently of Oidium. . . .

He concludes that—

> The appearance of Oidium, which caused such lively alarm to viticulture, has really been, through the acquisition of sulphuring, the occasion of the most notable progress made by it for a long time, and instead of ruin, such as was feared, Oidium became for it a cause of prosperity and improvement.

Later authorities generally confirm these views. Foex, though he does not go quite so far, expresses a similar opinion—

> Sulphur does not only act as a means of freeing the vine from *Erysiphe*,‡ it seems besides to exert a remarkable effect on vegetation: a week after the operation a sulphured vineyard shows very marked verdure and vigour, as compared with one that has received no treatment. Is this effect, due to direct action of sulphur on the leaf, analogous to that exercised by iron sulphate on the green parts of plants? This point has not been settled, but it seems probable."§

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* Faulty setting of the blossom.

† The leading wine growing department of France.

‡ The older name for the Oidium fungus.

§ G. Foex: *Cours Complet de Viticulture*, p. 421

The above quotations, if somewhat lengthy, seem warranted. They will remind practical growers of an aspect of the sulphuring question, which seems to be too little recognised in this State.

The beneficial effect on the blossoming of the vine is even more generally recognised. Bioletti,[*] after mentioning the tonic action described above, says—

> The favorable influence of sulphuring the vines, while in blossom, on the setting of the fruit is even more generally recognised. If Oidium is present, this is easily accounted for by the prevention of the action of the fungus on the blossoms. The effect, however, is noticed even when no Oidium exists in the vineyard. The tendency of many varieties to "*coulure*"—dropping their blossoms without setting—can be lessened by vigorous sulphuring during the blossoming period. Whether this is due to a stimulation of the floral organs under the action of the sulphur, to the destruction of unrecognised fungi on the blossoms, or merely to the mechanical action of the current of air produced by the blowers in promoting pollination, has never been determined.

The manner in which sulphur stimulates the vine is not clear. Incorporating this element in certain soils has an apparently manurial action and increases fertility.[†] Its action on the foliage, &c., seems to be of a different order. Does it act by increasing transpiration, thus causing the vine to absorb more soil solution, and consequently more plant food? Such has been suggested to explain a somewhat similar stimulation by copper sprays.

In many parts of the State the vines are not sulphured at all. In view of the above, we are probably unwise in confining the sulphuring of our vines to seasons when Oidium, by its presence, compels us to apply it. Sulphuring as a regular part of the yearly cycle of vineyard work—Oidium or no Oidium—would probably pay handsomely for its application, solely owing to its tonic action. If thus applied, blossoming would be the most opportune moment, though a later sulphuring might be useful in cases where an advance in the date of ripening is desired.

Vine-scald due to sulphuring.—Sulphuring in very hot weather may cause scalding of the green vine tissues—leaves, young bunches, &c. In severe cases some of these may even be so badly affected as to fall off. When the grapes are about half grown, the hardening of the skin preventing normal expansion, the berries may split or be distorted; if nearly ripe, brown purple blotches are caused on the side facing the sun; in either case the fruit is spoiled, especially for table and drying purposes. It is chiefly in a heat wave that injury of this kind is caused—according to Bioletti, damage only occurrs at temperatures in in the neighbourhood of 110 deg. F., or with very susceptible varieties sorts. Vinifera varieties stand sulphur well, but some American species and their hybrids cannot tolerate it, notably some direct producers such as Othello, Nos. 112, 903, &c., which are sometimes said in France to fear sulphur more than Oidium.

When scalding is feared it has been recommended to apply sulphur to the soil or to the crown of the vine. Concerning the former, Bioletti says—

> Practice has shown that sulphur placed in this position (on the soil) has almost no effect on the Oidium except in exceedingly hot weather. . . . In

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[*] Oidium or Powdery Mildew of the Vine, by Frederic T. Bioletti, p. 320 :—University of California Publications, Bulletin No. 186.

[†] See *Journal* for May, 1914, p. 289. Sulphur in the soil increases fertility by rendering nitrification more active. It thus has a positive, though indirect, manurial effect in soils which contain sufficient organic matter.

exceptional cases, as, for instance, where very vigorous vines are growing in very moist places in the irrigated regions, or when unusual hot weather occurs in the coast regions, the air may be moist enough for the growth of Oidium even when the temperature rises to considerably above 100° F. In such cases it is sometimes desirable to sprinkle the sulphur on the ground instead of on the vine.

In very hot weather it is well to suspend sulphuring during the hottest part of the day, limiting its application to early morning and evening. It is, however, obvious that in really hot weather sulphuring is almost superfluous. At 104 deg. F. the temperature alone destroys Oidium, especially if the air be dry.

The kind of sulphur used is of great importance; some sorts scald worse than others. Sublimed sulphur (flowers), owing to the free sulphuric acid it contains, is more severe than ground sulphur. The addition of a little lime, by neutralizing the acid, considerably reduces the liability to scald. Likewise, the admixture of plaster (gypsum) or other inert substances to dilute the sulphur; the mixtures of this kind, described below, are less liable to scald than pure sulphur.

The kind of sulphuring appliance used is also a factor of importance; those which distribute thinly and evenly expose to much less scalding. Uneven distribution, on the contrary, aggravates it; the patches receiving too much sulphur, of course, suffer most.

Injury to the Workmen's Eyes.—This depends largely on the sulphur distributor and the kind of sulphur; the hessian bag method of application gives most trouble. The kind of sulphur is of even greater importance. Sublimed sulphur, owing to its free acid, is much worse than the ground form; the addition of lime corrects this defect by neutralizing the acid.

Should the eyes become inflamed the remedy is simple: a solution of soda bi-carbonate (baking soda) at the rate of a small teaspoonful to a large tumbler of water, applied with an eye-bath, gives immediate relief.

The "Sulphur Taste" in Wine.—Sulphuring too short a time before vintage exposes the wine to incur this unpleasant taint; the sulphur introduced with the grapes into the fermenting vat produces, owing to the reducing action of the yeast, sulphuretted hydrogen, with its well-known taste and smell of rotten eggs. If sulphur must be applied shortly before vintage, it is well that it should be in diluted form and thinly distributed by means of an efficient machine.

THE DIFFERENT KINDS OF SULPHUR.

The sulphurs which may be used for Oidium control differ enormously in their efficiency. Much of that obtainable locally is of little use for the purpose owing to its being in too coarse a powder. Fineness of particles is the first essential; it is, as a matter of fact, of more vital importance than purity. A sulphur containing even a large proportion of impurities, but in fine dust, is of far more use than chemically pure sulphur in too coarse a powder. The importance of extreme fineness is obvious; without it a powder cannot be expected to adhere. Sand sprinkled on the vine foliage immediately falls off on to the ground; a powder such as lime or flour largely adheres to the leaves; whilst an impalpable powder such as road dust adheres in a remarkable manner.

The finer the sulphur the further will it go; in other words, the bigger the vineyard area that can be treated by a given weight.

"The fine sulphurs are superior in three important respects:—(1) They are capable of more perfect distribution; (2) they offer a larger surface to the air, and, therefore, give off more fumes; (3) they adhere better to the leaves. A pound of very fine sublimed sulphur . . . the particles which measure .01 mm. in diameter, if evenly distributed and none lost, would give about 15,000 particles for every square inch of leaf and cane surface on an acre of large vines. A pound of a very coarse sulphur . . . , the particles of which have twenty-five times as large a diameter, would supply only about one particle for every square inch. Moreover, a much larger proportion of the coarse sulphur would be lost by failing to adhere to the leaves and falling to the ground. Perhaps the most important advantage of the finest sulphur in this respect is that the impalpable powder floats so lightly in the air that it reaches and adheres to the lower surfaces of the leaves and canes."*

Sulphur in powder is obtainable in three main forms, viz:—

(*a*) *Ground sulphur*, consisting of ordinary bar or lump sulphur, ground to a more or less fine powder.

(*b*) *Sublimed sulphur* or *flowers of sulphur*, obtained commercially by passing sulphur vapour into large masonry chambers where it condenses in minute flakes like snow.

(*c*) *Precipitated sulphur* or *milk of sulphur*, such as is obtained by decomposing the sulphides of soda, lime, &c., dissolved in water, by the addition of an acid.

Concerning the respective merits of ground and sublimed sulphur, much has been written. Provided the particles are of equal fineness there is little difference in efficiency. In shape the particles differ a good deal; those of ground sulphur are angular like broken road metal on a very small scale; those of sublimed sulphur are practically spherical and covered with minute warty protuberances; several of these small globules adhere together to form chains or flakes; they may, on a very minute scale, be compared to the yellow balls of wattle blossom pulled off the stalks. Sublimed sulphur is generally considered rather less adherent than ground sulphur of equal fineness, the angular nature of which gives it a better hold to the vine surface. Sublimed sulphur varies a good deal in fineness. In the best samples the concretions are small, light, and feathery, adhering well. Inferior samples, resulting from insufficiently rapid cooling of the vapour, are coarser grained and contain many large globular concretions composed of smaller grains agglutinated by heat; these fail to adhere to the vine, and are useless.

If sublimed sulphur is generally preferred, it is because the other is usually too coarsely ground; it is, however, quite possible to mill it as fine as the best flowers, to which it is then quite equal.

The colour of ground sulphur is a good indication of its state of division. Sublimed sulphur varies little in this respect, being of the well-known bright yellow colour. With ground sulphur, on the contrary, the finer it is the paler it is. A very pale colour is thus an indication of quality, provided it is not due to adulteration. Ground sulphur of as bright a yellow as the sublimed form is too coarse for vineyard use.

The two forms are easily distinguished from each other under the microscope, or even with a strong magnifying glass.

Sublimed sulphur is always acid; it contains a small quantity of free sulphuric acid—usually from one and a half to three parts per 1,000 of the weight of sulphur—this is due to the oxidation of sulphur dioxide resulting from the combustion of a small proportion of the sulphur, which always occurs during distillation. The presence of this acid was at one time held to give sublimed sulphur a superiority over the ground form; it was even considered, in some quarters, that the emanations fatal to Oidium consisted largely of sulphurous and sulphuric acids resulting from the slow oxidation of the sulphur. Such views, however, are incorrect (see page 683). The presence of this free acid is not only useless, but it presents several serious drawbacks. In addition to scalding the vine and irritating the workmen's eyes, as already described, it is very severe on the implements used to apply the sulphur as well as on the bags used to contain it.

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* Bioletti, *ibid.*

Sublimed and ground sulphur differ considerably in chemical nature. The former consists of granules of insoluble or electro-positive sulphur, enclosing electro-negative or soluble sulphur, the proportion of the former varying from 18 to 30 per cent. Ground sulphur consists almost entirely of soluble sulphur, it only contains from 2 to 5 per cent. insoluble.[*] Whether or not these show differences in the emanations they give off on the vine does not seem clear. Electro-positive sulphur seems to oxidize more easily than the electro-negative form. The emanations yielded by ground sulphur are in any case ample, and the two forms are generally admitted to be equally effective provided they are of equal fineness. The great bulk of the sulphur used in France is in the ground form.

Precipitated Sulphur or Milk of Sulphur.—If a strong acid be added to a solution of sulphides of lime, soda, &c., the sulphur is precipitated in an almost impalpable powder and in the electro-negative or soluble form (same as ground sulphur). Sulphur is similarly precipitated in a more or less impure form as a by-product of several chemical industries. Though not widely used for vineyard sulphuring, this form should show marked superiority owing to its extreme division. Pacottet[†] mentions having examined samples ten times finer than flowers of sulphur, and as adherent as talc; he expresses regret that this form is not produced more abundantly. Precipitated sulphurs are rather apt to form into lumps; these, however, are readily pulverized by the feed mechanism of most sulphuring appliances. The products known to the trade as "Atomized" and "Atomic" sulphurs, &c., are of this type. Being in the form of paste they are only suitable for making up liquid sprays (see later).

SULPHUR EXAMINATION.

Purity of sulphur is easily tested by burning a small quantity on a piece of broken china plate; it is well to heat over a spirit lamp or stove, to assist combustion. If pure the sulphur burns away altogether; if impurities are present they remain as a solid residue. Though absolute purity is not essential for efficiency, the deliberate addition of foreign substances constitutes a fraud, unless stated in the invoice; the buyer pays for sulphur, not for inert substances. Sublimed sulphur should always be pure, ground sulphur usually leaves a slight residue on burning.

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[*] Sulphur presents the peculiarity, not uncommon among elementary substances, of existing under several distinct allotropic forms. The most important are that in octahedral crystals, that in prismatic crystals, and an amorphous form Both crystalline forms are electro-negative and soluble in carbon bi-sulphide. Amorphous sulphur is electro-positive and insoluble in carbon bi-sulphide. The three forms differ in specific gravity and in melting points The octahedral form is the most stable, and the one to which all the others ultimatly revert.

[†] Pacottet 2—*Viticulture*, p. 363.

Fineness of particles can be ascertained in various ways. With ground sulphur, if pure or nearly so, colour is a good indication—the paler the finer. Sublimed sulphur does not vary in this way.

Rubbing between finger and thumb enables a practised person to form a fair idea of quality, but the "feel" is different with sublimed or ground sulphur. That of the former is soft and velvety like flour—almost greasy; it slips under the fingers and crackles slightly if a small quantity be squeezed. Ground sulphur is less slippery, but crackles more; though distinctly more gritty than sublimed, it should not be so to such an extent as to indicate the presence of large particles.

Microscopic examination gives an excellent idea of the size of the particles, and permits of rapidly distinguishing sublimed from ground; mixtures of the two forms are sometimes met with. In some cases particles of very different sizes are mixed together; the presence of a large proportion of coarse particles much reduces value for vineyard purposes; these being incapable of adhering to the vine, constitute so much useless matter. In the absence of a microscope a strong magnifying glass (10 to 20 diameters) gives useful indications; to examine more conveniently, place a minute quantity on a glass plate and spread by wetting with a drop of methylated spirit.

The weight of a given volume of sulphur varies very considerably with its fineness; the finer it is, the more bulky. If several sulphurs are in sacks of equal weight the largest sack will contain the finest sulphur. A 110-lb. sack of good flowers of sulphur is twice as large as a 110-lb. sack of very coarse ground. (Bioletti.)

The Chancel test is a very convenient way of rapidly determining the collective value of a sample; it is based on the bulkiness of fine sulphur. Before applying it the purity of the sulphur should be tried by burning, since the presence of foreign substances interferes with accuracy.

The chancel tube is a narrow trial jar of 25 cc. capacity divided into 100 divisions. Five grammes of sulphur are weighed and gradually tipped into the tube, with the addition, in two or three lots, of ordinary ether, which wets it well, penetrating all the interstices. The tube is then closed with the thumb, well shaken, and allowed to rest so that settling may take place. More time is required for ground than for sublimed sulphurs. By reading the number of divisions occupied by the sulphur an idea can be formed of the relative fineness of different powders. Good commercial flowers of sulphur occupy 50 to 70 divisions of the chancel tube, those of superior quality 75 to 90, the finest ground sulphur 60 to 70, and ordinary samples 43 divisions.

It is possible to have sulphurs ground and bolted (sifted) to a state of fineness, which, though not equal to that of flowers, is sufficient, and as they are less costly and present some secondary advantages, there should be no hesitation about giving them preference.*

MIXING OTHER SUBSTANCES WITH SULPHUR

In order to insure even distribution it is necessary to apply much more sulphur than is really needed to control Oidium; lighter dustings, however, would result in its being only applied here and there, leaving large patches untreated and, therefore, unprotected. Mixing the sulphur with inert substances of little value overcomes this difficulty:

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* P. Viala :—*Les Maladies de la Vigne*, p. 53.

the much reduced price of the mixture permits more lavish application such as will insure perfect distribution, whilst the sulphur particles are deposited quite closely enough for efficiency. At Apt, in Department Vaucluse (France), deposits occur consisting of gypsum mixed with sulphur, the proportion of the latter being about 20 per cent. This substance, ground to a fine powder, is much used in French vineyards under the name of *soufre d'Apt* (Apt sulphur). According to Viala, Apt sulphur, applied twice as plentifully as pure sulphur, is almost as effective, whilst it reduces the cost of treatment to one quarter. He considers Apt sulphur specially suited for later applications, when the vines have grown to large size. For the first and second treatment (blossom) he advises pure sulphur. The later applications being those which demand most sulphur, it is in connexion with them that economy is most advantageous.

In addition to the obvious economy, diluted sulphurs, such as the above, present other advantages of importance; they do not scald or burn in hot weather to the same extent as pure sulphur; they spare the eyes of the workmen, they are more easily distributed from bellows or dusters, which they do not clog; and, lastly, they are less liable to communicate a bad taste to the wine. Mixtures of this kind, both natural and artificial, have been extensively used in France for over half-a-century. They were strongly recommended by Marès nearly sixty years ago; his formula consisted of 34 parts pure sulphur, mixed with 66 parts of roasted plaster (gypsum) or of ashes. Various proprietary mixtures are largely used in Europe to-day; they are sold under different trade names; also as black sulphur, green sulphur, &c. One such was rather extensively sold in this State some years ago under the name of "Par-oidium." Some of these are mixtures of sulphur and charcoal, others seem to be finely-ground iron pyrites, which, of course, contains much sulphur. Most of them are in exceedingly fine powder, and therefore convenient and economical to apply. Provided they contain sufficient sulphur—say, 40 or 50 per cent.—they may, owing to their fineness, prove more effective than the very coarse though possibly pure sulphur often supplied in Australia. It is well to only purchase brands which are above suspicion; the guaranteed sulphur content should also be stated on the container, as there is strong temptation for this to be unduly reduced by unscrupulous manufacturers.

Mixed powders containing sulphur together with about 10 per cent. of copper sulphate are largely use in France for the combined treatment of Oidium and Downy Mildew, &c. They are of value to supplement copper sprays in cases where Oidium has to be treated concurrently with Downy Mildew. For further details concerning these, see Bulletin No. 49 on Downy Mildew.

MIXING LIME WITH SULPHUR.

The practice of mixing lime with sulphur is of more recent date than the above mixtures. It is true that dry dustings of lime and sulphur were recommended in most French text-books of thirty years ago for the summer treatment of anthracnose; they have since been discarded (see Bulletin No. 42, page 27), but for Oidium control such mixtures seem highly desirable. In France, indeed, lime seems, of recent years, to be largely taking the place of the plaster or ashes recommended by

Marès as a diluent for sulphur. It is true that in that country, sulphur has, for many years past, been so cheap and of such good quality that there was little need to dilute it on the score of economy. During the late war, however, sulphur became so dear that its more economical use was a live question. Professor Degrully,[*] discussing it in 1916, quotes E Combemale[§] who, in 1903, described how he had completely protected his vineyard from Oidium during the previous six years with four applications per year of a powder composed of—

Ground sulphur . .	50 parts.
Freshly slaked lime	25 ,,
Cupric steatite[†] . . .	25 ,,
	100 ,,

The third component served to render the powder effective against Downy Mildew as well as Oidium.

Several other writers mention as being quite as effective as pure sulphur, mixtures containing from 35 to 50 per cent. of lime. In some of these, part of the lime (usually 10 per cent. of the total weight of the mixture) is replaced by copper sulphate, for reasons explained above. Cadoret,[‡] indeed, considers that the addition of lime increases the action of the sulphur; he describes remarkable results obtained with such mixtures in Department Hautes Alpes, where Oidium outbreaks are of unusual severity.

M. Thesmar,[**] President of the Syndicat Agricole of Tlemcen (Algeria), writes, "The best way to economise sulphur is, in my opinion, to mix it half-and-half with lime for the first sulphuring, and with two-thirds for the following ones. With these proportions our vines have always been preserved from Oidium"

Lime is thus an excellent diluent for sulphur; in addition to economy without loss of efficiency, its admixture should often prove highly desirable in Northern Victoria, to lessen scorching when sulphur has to be applied in hot weather, more particularly if the sulphur in use be the sublimed form, since its undesirable free acid is thus neutralized immediately.

The increased efficiency claimed in some quarters for the mixture may possibly be explained by the formation of small quantities of calcium sulphides (lime sulphur) under the influence of the moisture provided by dew or light rain.

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[*] *Progrès Agricole,* 10th December, 1916.

[†] Cupric Steatite is one of the copper-containing powders largely used in France to supplement copper sprays applied against Downy mildew ; it consists mainly of finely powdered talc or Steatite with 10 per cent. of copper sulphate

[§] Communication to the Société Départementale d'Agriculture de l'Hérault—July, 1903,

[‡] *Progrès Agricole,* 20th September, 1914.

[**] *Progrès Agricole,* 10th December, 1916.

(To be continued.)

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STANDARD HERD TEST.

Report for Quarter ended 30th September, 1923.

The cows which completed the test during the quarter number 427, of which 308 succeeded in qualifying for the certificate. The following are the individual records.

Owner.	No. completed Test	No Certificated.	Breed.	Name of Cow	Herd Book No.	Date of Calving.	Days in Test	Milk last Day of Test	Milk	Average Test	Butter Fat	Standard required	Estimated Butter.	Previous Butter Fat Records in lbs
								lbs	lbs.		lbs	lbs.	lbs.	
S. T. Algie, Murraydale	1	1	Shorthorn	Daisy 5th .. .	Not yet allotted	16.11.22	273	11	6.904	3 67	253·20	250	288½	
J. Anderson, junior, Lyndhurst	2	2	Jersey ..	Linda 52nd of Kingsvale ..	9177	19.11.22	273	21	7.764	5 56	441·48	200	503¼	365
				Lucy of Kingsvale .. .	3809	12 11.22	273	16	6,134	6 11	374 85	250	427¼	377
W. K. Atkinson, Swan Hill	8	8	Shorthorn	Blanche Rose 9th . ..	10891	27.9.22	273	14¼	11.297	3 86	435.81	250	496¾	272, 316, 365, 387, 357
				Queenie 4th of Willow Park ..	12557	28 9 22	273	13½	4,945	4 10	202 98	175	231¼	
				Cherry of Willow Park ..	9198	9 10 22	273	40	15,880	4 00	635 92	250	725	325, 474
				Poplar Vale Princess 29th .	Not yet allotted	13.10.22	273	8	7.602	3 77	287 87	250	328	220, 237
				Duchess 2nd of Willow Park..	11452	25.10.22	273	13½	5,660	3 88	219·70	175	250½	
				Countess of Willow Park ..	9250	28.10.22	273	8½	9.600	4 24	381 99	250	435½	264, 330
				Princess of Willow Park ..	12510	11 11 22	273	18½	9.476	3 88	368 02	200	419½	256
				Cherry 5th	10893	24.12.22	273	21	8.500	3 88	330·01	250	376¼	235, 218, 269, 343, 284
C. Bamford, Benalla	3	3	Ayrshire	Honeycomb of Medburn Grove	10747	4 10 22	273	17½	6.039	4 38	264·44	175	301½	
				Moonbeam of Medburn Grove	8307	8.10 22	273	15½	9,160	4 26	389 82	250	444¼	255, 327
				Marjorie of Medburn Grove ..	8305	8 12 22	273	21	6,707	3·72	249·83	200	285	252
A. E. Batson, Buckley	6	6	Jersey ..	Daisy 2nd of Somerset ..	9190	25 9 22	261	4	2 932	6·70	196 50	175	224	
				Daisy 3rd of Somerset ..	9191	20 10.22	273	5½	4 449	5.49	244 28	175	278½	
				Daphne of Somerset ..	9192	27.10.22	273	6	4.438	5·85	260·13	200	296½	158
				Lady Marge of Ferndale ..	6368	29 10 22	273	5	4,726	5 86	276 75	250	315½	278, 282
				Lady Marge of Somerset ..	10144	13.11.22	273	8	3,827	5 47	209 25	200	238½	152
				Nancy of Somerset .	9198	31.10.22	228	4	3,576	6·08	217·41	200	248	172

Standard Herd Test—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
Mrs. Irene Beard, Outtrim	4	4	Jersey ..	Shadow of Linga Longa	11238	28.10.22	273	9½	5,380	5 65	304 15	175	346¾	
				Canary 2nd of Lesterfield .	10431	18 10.22	273	9	5 795	5 55	321 74	250	366¾	
				Nanette 2nd of Warenda .	6142	12.11 22	273	13½	5,979	5·95	355 92	250	405¾	202, 367
				Shadow of Luscombe .	6143	18 11 22	246	6	7,022	5 12	359 43	250	409¾	262, 281, 323, 390
F. W. Beischer, Bendigo	3	3	Jersey ..	Mischief of Linden .	10610	26 10 22	273	6	2.815	6 60	185·73	175	211¾	
				Rita of Linden . .	7533	16 11 22	273	14½	6.940	5·14	356 99	250	407	
				Tulip of Meridale	7515	24 12 22	273	19½	6,636	5·63	373 90	250	426¼	228, 279, 233
J. Benallock, Elliminyt	7	5	Ayrshire	Betty of Woodbyrne ..	6117	29 9 22	271	4	5,348	4·35	232·81	200	265	
				Phyllis of Woodbyrne .	6119	6.10 22	242	4	5,309	3 94	209 25	200	238½	222
				Mavis of Woodbyrne	7048	7.10 22	273	10½	5,141	3·91	200·85	175	229	
				Pearl of Woodbyrne .	7051	7 10.22	273	8½	5.011	4 57	228 86	175	261	
				Pert Lass of Woodbyrne	4895	15 10 22	257	4	6,757	4 43	299·27	250	341¼	220
F. Bidgood, Staghorn Flat	1	1	Jersey .	Fox's Bluebell of Staghorn .	11252	3 10.22	273	10½	3,847	5 45	209·71	175	239	
A. A. Broad, Sutton Grange	2	2	Jersey .	Daisy of Grangelea	11266	10.11.22	273	8½	3,352	5 88	196 97	175	224½	
				Princess 2nd of Grangelea .	9227	15.11 22	273	17	7,720	4 90	378 57	200	431½	372
Callery Brothers, Bannockburn	6	5	Ayrshire	Myra of Langley Park .	6183	27.9.22	273	13½	7,560	4·12	311 32	250	355	337
				Empress of Langley Park .	6178	27.10 22	245	4	7,167	3·85	276 27	250	315	266, 278
				Star of Langley Park .	8557	29.10 22	273	15	4,859	4 15	201·81	175	230	
				Snowflake of Rythdale ..	2842	14.11.22	204	4	6,342	4·17	264 19	250	301¼	241, 346, 273
				Queenie of Langley Park .	6184	15 11 22	273	11½	6,505	4 78	311 22	250	354¾	237, 261
H. D. W. Canobio, Toolamba	2	2	Ayrshire	Beauty of Quarry Hills ..	10135	10 10 22	273	4½	8,306	4 56	378 66	250	431¾	307
				Primrose of Wethersdane ..	5285	23 11.22	273	4	6 892	4 01	276·60	250	315¼	263

Standard Herd Test—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
Mrs. M. E. Carroll, Tyntynder Central	4	Nil	Red Poll											
J. Carter, Marong ..	1	1	Friesian	Dinah . .	Appendix	7.10 22	273	27½	9,201	4·57	420 68	250	479½	
J. E. Chadderton, Hamilton	1	1	Jersey ..	Duchess 10th of Kyora .	6835	15.10 22	273	22	8,964	5 07	454 43	250	5'8	
P. Chirnside, Oakleigh	6	6	Jersey ..	Meadow Sweet of Warenda . Phyllis 2nd of Warenda . Garenne 4th of Warenda . Keepsake of Warenda . Music of Warenda .. .. Graceful Countess 2nd of Lesterfield	9567 7195 9565 8566 7193 10268	29.9.22 2.10 22 12.10 22 14.10.22 24 10 22 7.12 22	273 273 273 273 273 273	21½ 20½ 19 16 18 22	7,202 8,466 7,644 5,839 6,587 6,454	6 09 5 06 5 61 5 86 5 39 6 33	438 94 427 97 429 10 342 33 355 10 408 37	200 250 200 250 250 250	500½ 488 489¼ 390¼ 405 465¾	404 310, 373 434 248, 349 256, 385 210, 369
Clyne Brothers, Tinamba	1	Nil	Jersey											
Cockbill and Gibbs, Lancefield	14	Nil	Ayrshire											
E. O. Cudmore, Coldstream	2	2	Jersey ..	Peerless 19th of Melrose .. Laura 10th of Melrose .	7546 9893	30.10.22 7.11.22	273 273	12 13½	5.966 5,323	5·32 6·22	317·65 330·83	250 250	362 377¼	289, 343* 283, 391
O. Cutler, Swan Hill	3	3	Jersey ..	Silk Stockings of Leahurst .. Bright Stockings of Warenda Meg of Elthamleigh ..	11326 7189 9185	28 9 22 9 10 22 8.11 22	273 273 273	13 12 10	4.918 6,338 5,830	5 54 4 84 4 76	272·62 306·49 277 77	175 250 250	310¾ 349½ 316¾	 238, 296 330

* This record when published was in name of Peerless 20th of Melrose.

Standard Herd Test—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs
E. A. Denis	1	1	Jersey	My Hope of Lynuilg	11710	13 10.22	273	lbs. 10½	lbs. 4 011	4·96	lbs. 198 74	lbs. 175	lbs. 226½	
Department of Agriculture	2	2	Friesian	Victoria Joybell	995	26.10 22	273	19	6,986	4 29	299 71	175	341¾	
				Victoria Corunna	989	29 10 22	273	4	9,202	3 84	353 11	250	402½	271
	7	7	Red Poll	War Queen	327B	11 10 22	273	8	5,163	4 09	211·00	175	240½	
				Victoria Rose Major	5AA	13.10.22	273	9	5,482	3 94	215·74	175	246	
				Ornitha	313B	14.10.22	273	6½	6,417	5 11	328 17	250	374	208, 247
				Melilla	247A	20.10.22	273	20	6,681	4·00	266·91	175	304¼	
				Victoria Velvine	8AA	25.10.22	273	4	5,422	4·59	249·13	175	284	
				Topflight	3_5B	27. 0.22	273	15	4,209	5 00	210·38	175	240	
				Briar	379C	12.12.22	246	4	7,563	4 36	329 68	250	375¾	254. 297. 364, 364, 391
Dickinson Bros , Sebastopol	3	3	Friesian	Pauline 3rd of Ashby	1002	3 10.22	273	26½	7,811	3 32	259 70	175	296	
				Queenie of Ashby	267	18.10.22	273	24½	14,158	3 72	526 00	250	599¾	296, 440, 487
				Jean 2nd of Ashby	1003	22.10.22	273	21½	7.558	3 40	256 85	175	292¾	
S. Earle, Merricks	1	Nil	Jersey											
S H Ebery. Newstead	2	2	Shorthorn	Daisy 7th	Not yet allotted	25 9 22	273	14	7,058	3 99	281·59	200	321	
				Daisy 8th	,,	1.12.22	273	16	5,735	4 45	255·43	175	291¼	
Evans Bros., Lima East	1	1	Red Poll	Arbour 4th	Not yet allotted	28 9 22	273	5½	6,848	4 08	279 13	200	318¼	
C. Falkenberg, Elliminyt	3	Nil	Jersey											

STANDARD HERD TEST—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
R. Faragher, Koroit	1	1	Jersey .	Belle of Mona Bank ..	11399	18 10 22	273	5½	4.663	5 32	248 10	175	282¼	
R. Ferguson, Riddell	1	1	Friesian	Springfield 14	1010	6 12.22	269*	20	9.732	3·24	315 19	200	359½	
A. E. Fewster, Nilma	1	1	Jersey	Linda 35th of Kingsvale ..	6278	5 10 22	273	16	6,661	5·12	341 02	250	388¾	328
A. W. Findlay, Leitchville	2	2	Jersey ..	Werribee Northwood's Attraction	6538	27.9 22	273	11	5.342	5·86	312 86	250	356¾	341
				Larkspur of Tuerong .	10481	17.10.22	273	9½	5.257	5·14	270·12	175	308	
Finn Bros., Bundoora	4	4	Jersey ..	Thana of Somerville .	6947	4.10.22	273	13	9,742	5·65	550 44	250	627¼	359, 486
				Princess Royal of Springhurst	5403	24.10 22	273	15	9,613	5 26	505 69	250	576½	294, 334, 412 461
				Valda's Queen of Somerville .	5948	5.11.22	273	8½	8,766	4 70	411·69	250	469¼	464. 336
				Trixie of Tarnpirr	5173	26 11.22	273	10	7,346	5 85	429 43	250	489½	355. 457, 516, 480
Fixter and Sons, Boisdale	1	1	Jersey ..	Queenie of Riversdale .	12922	24 12.22	273	13	4,377	5·61	245·65	175	280	
Flack and Sewell, Berwick (Burnbank Herd)	1	Nil	Friesian											
Flack and Sewell (Ardblair Herd)	3	3	Friesian	Bainfield Topsy 15th ..	Not yet allotted	5.11.22	273	19	7,465	4 69	349·75	175	398¾	
				Rosevale Jessie Posch ..	1096	20.12 22	273	41	11,944	3 17	378 95	200	432	354
				Rosevale Rosie Abbekirk ..	1094	21.12 22	273	29	12,318	3·52	433 99	200	494¾	347

* Withdrawn before completion of term

STANDARD HERD TEST—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No	Date of Calving	Days in Test	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
Flack and Sewell (on A. V. Becher's farm)	3	1	Friesian	Burnbank Inka Sylvia Walulu	Not yet allotted	5.11.22	273	lbs 17	lbs. 5.273	3·56	lbs. 187 55	lbs 175	lbs. 213¾	
M. and W. A. Francis, Kilcunda	1	Nil	Ayrshire											
M. Galbraith, Tyers	3	Nil	Ayrshire											
G. Gange, Mininera	1	1	Ayrshire	Eva 2nd of Glencairn ..	7298	7.12 22	273	5½	6,879	4 05	278·53	250	317½	280. 270
N. Gange, Mininera	5	2	Ayrshire	Petal of Roseleigh .. . Pansy of Roseleigh ..	7303 7292	6.10.22 13 10.22	273 262	10 4	7.516 4,878	3 47 4 51	260·78 220 14	250 175	297¼ 251	238
Geelong Harbor Trust, Marshalltown	8	7	Ayrshire	Bluebell of Sparrovale ..	3886	25.9 22	273	10½	7 797	4 00	311 81	250	355¼	176, 299, 361, 338, 315
				Gipsy Girl of Sparrovale ..	3894	8 10 22	273	5½	7,515	4 71	353 97	250	403½	324, 372, 309 324
				Nancy of Sparrovale ..	9102	11.10 22	273	6	3 761	4 69	176·28	175	201	
				Blossom of Sparrovale ..	3885	12 11 22	267	4	6,376	4 25	270 89	250	308¾	266, 315, 307
				Boronia of Sparrovale ..	7309	14.11 22	273	17	8,809	4 53	403 10	200	459½	400
				May of Sparrovale	3902	22 11.22	273	7½	7,025	3·94	276·54	250	315¼	236, 267, 276, 350
				Poppy of Sparrovale ..	9106	30.11 22	273	17½	6.195	4 12	255 33	175	291	
F. S. Gibson, Murraydale	6	5	Ayrshire	Pansy 3rd of Evergreen .. Duchess 2nd of Evergreen .. Rosella of Sunnyside . Dulcie of Evergreen . Highland Queen of Evergreen	9120 9114 7687 9115 7319	26.9 22 30 9.22 11.10.22 31.10 22 11.12.22	273 273 273 273 273	17 12 15 14½ 8½	6.808 5,461 7,761 7.704 8.008	4·46 4 02 4 51 4 31 4·31	303 71 219 59 340·19 332·12 345·27	175 175 250 200 250	346¼ 250¼ 387¾ 378¾ 393¾	263 327

Standard Herd Test—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test	Milk last Day of Test.	Milk.	Average Test	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs		lbs	lbs	lbs	
Gibson Bros., Trafalgar	3	3	Jersey ..	Buttercup 12th of Ferntree Vale Buttercup 15th of Ferntree Vale Laurie	9375 9376 3043	26 9 22 2 10 22 25 10 22	273 273 273	11½ 12½ 15	6,603 5,592 6.168	5·96 5·38 5 81	393 46 300·95 358·48	250 175 250	448½ 343 408¾	274
R. Goodman. Kilmany South	3	2	Ayrshire	Vanity of Burnside Gem of Burnside . .	9137 9133	28 9 22 7 10.22	273 273	13½ 15	5,614 5,009	4 54 4.57	254·94 229 14	250 175	290¾ 261¼	218
D. F. Griffiths, Inverleigh	2	0	Ayrshire											
T. Harvey, Boisdale	2	2	Jersey .	Sparkle 2nd of Jerseyholm . Bluebell 3rd of Jerseyholm ..	5920 9391	6.10 22 29.10.22	273 273	13 16½	6 764 6,711	5·84 5 56	394 82 372 81	250 200	450 425	304, 415. 414
W. Henderson, Grasmere	37	3	Ayrshire	Lola of Carracoorte .. . Gerty 3rd of Carracoorte . Lucy 3rd of Carracoorte .	9401 9376 9405	30 9 22 3 10 22 17 10 22	247 273 204	4 7 4	4.120 5.945 3,740	4 38 5 04 4 84	180 45 299 69 181 03	175 250 175	205¾ 341¾ 206¼	221, 218
J. Hutchinson, Somerville	4	4	Jersey ..	Midilli of Somerville .. Beauty 5th of Somerville . Vesta of Somerville .. . Princess Valda of Somerville	11486 9413 11491 11488	26 9 22 1.10 22 7 10 22 17.10 22	273 273 273 273	21½ 19½ 21½ 21½	6,637 8,703 7,262 6,687	4 79 4 40 5 10 5 11	317 73 382 75 370 53 341·93	175 200 175 175	362¼ 436¼ 422½ 389¾	258
A. W. Jones and Son, Whittington, near Geelong	5	5	Jersey ..	Lady Grey 12th of St Albans Lady Grey 17th of St. Albans Lady Grey 15th of St. Albans Blue Lass of Linden .. Rose of Hillcrest .. .	9433 11514 10275 7520 6017	20 10 22 17 11 22 29 11 22 18 12.22 24 12 22	273 273 273 227* 273	10½ 18 24 13 13	5.872 5 634 7.331 3,959 5.336	5 57 5·28 5 38 5 27 5 01	327 11 297 62 394·00 208·53 267·15	250 175 200 200 250	373 339¼ 449¼ 237¾ 304½	321, 302 311

* Sold before completion of term

Standard Herd Test—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No	Date of Calving.	Days in Test	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs	lbs		lbs.	lbs.	lbs.	
A. W. Jones and Son —*continued.*	10	10	Friesian	Tulip Flower ..	1029	28 9 22	273	31	11.132	3 31	368 44	250	420	308, 417
				St. Alban's Daffodil Mercena	651	23 10.22	273	23½	8,559	3 72	318 27	175	362¾	
				St. Alban's Lady ..	360	26 10 22	273	11	9.612	3 41	328 05	250	374	279, 328, 378
				Beryl of Craigneil .. .	1034	7 11.22	273	23½	10,057	3 57	359 33	200	409¾	294
				Ransome Lass 2nd .. .	1033	8 11 22	273	22½	10 653	3·64	387·39	200	441¾	298
				Her Royal Highness .	359	9.11.22	273	37	12,455	3 32	413 58	250	471½	355, 396, 441
				Queen Curley .. .	1027	1 12 22	273	21	10.244	3 43	351 71	250	401	288, 422
				Daffodil Mercena ..	1030	4 12 22	273	31½	10,443	3.76	392 45	250	447½	326, 484
				Westmere Pontiac Magpie .	Not yet allotted	8 12.22	273	18	7,288	3 87	281·70	175	321¼	
				May Queen 2nd	347	20.12 22	273	19½	10.200	4·55	464·45	250	529½	410, 519, 617, 391, 534
A. Joshua, Berwick	4	4	Jersey ..	Chaffinch of Banyule .	9481	29.9 22	273	4	5,511	5·67	312 37	200	356	
				Christmas Bell of Hillcrest	7032	30 10.22	273	8	5,679	4·97	282 17	250	321¾	
				Mistletoe 3rd of Tarnpirr	9443	6 11.22	273	6	4,395	5 78	253 93	200	289½	
				Violet of Hillcrest . .	7048	7 12 22	273	11	6,724	4 67	314 05	250	358	
G Kent, Archie's Creek	4	4	Ayrshire	Bud of Woolamai Park .	7434	28 9 22	273	11	4 582	4 61	211 41	175	241	224, 244
				Peggy of Woolamai Park	5275	4 10 22	273	6½	6.137	4 35	266 83	250	304¼	
				Marjory of Woolamai Park .	7437	9 11 22	273	4	4.069	4 43	180 38	175	205½	
				Daisy of Woolamai Park	7435	13.11 22	273	7	4,117	4 47	184 06	175	209¾	
Kerr Bros., Bacchus Marsh	8	7	Shorthorn	Morven Duchess of Brunswick 3rd	Not yet allotted	2.10 22	273	10	6,750	4·33	292·11	200	333	234
				Morven Duchess 15th .	..	3.10 22	273	9	10,024	3 81	381 57	250	435	285, 350, 374
				Morven Duchess 13th .	..	4.10 22	273	8½	8.906	3 95	351 57	250	400¾	306, 361, 366
				Morven Nellie 10th .	..	11.10 22	273	15	5.758	3 97	228 74	175	260¾	
				Morven Daphne 15th .	..	12.10 22	273	8	6.995	3 82	267 36	175	304¾	
				Morven Cressida 2nd .	..	21 10 22	271	5½	6.126	3 99	244 48	250	278¾	236, 250
				Morven Pearl 8th ..	..	7 11 22	273	28	13,903	3 95	548 49	250	625¼	338, 446
A. Kirby, Daylesford	2	1	Ayrshire	Sparkle of Gleneira ..	4001	17 10 22	273	17½	7,260	3·83	279 95	250	319¼	251, 232, 224

STANDARD HERD TEST—*continued.*

Owner	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No	Date of Calving	Days in Test	Milk last Day of Test.	Milk	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs
								lbs.	lbs.		lbs.	lbs	lbs.	
P. H Lawrence, Agnes	2	2	Jersey ..	Noble's Morocco of Rainga .	9456	4.11.22	273	19½	6,645	4 55	302 13	200	344½	266
				Little Queen .. .	5249	16.12 22	273	16¼	6,634	5 11	339·17	250	386¾	359, 366, 467, 376, 432, 325
C. Lees, Lockington	11	10	Ayrshire	Bertha of Winslade.. .	6979	9 10.22	273	11½	8,176	4·36	356 77	250	406¾	379
				Madge of Holly Green ..	6950	9.10.22	273	5½	5,940	4 20	249 73	200	284¼	213
				Selma of Burnside .	9749	11.10 22	273	4	6.163	4 62	285 02	250	325	
				Swiss of Springburn Park .	9754	15 10.22	273	10½	5,425	4·58	248 52	175	283½	
				Model 3rd of Gleneira ..	9739	24 10 22	273	14	7 917	4 21	333·32	250	380	
				Modesty of Yalart .. .	9741	6.11.22	273	4	7,243	3 97	287 37	250	327½	221
				Roseleaf 2nd	10701	16.11 22	273	19½	5.126	4 90	251 40	200	286½	
				Lady Lass 2nd .. .	11199	16.11 22	243	9	4.964	4 24	210 58	200	240	
				Dahlia 3rd .. .	10695	17 12 22	273	8½	5.195	4 45	231·17	200	263¼	
				Marilla of Burnside .	11202	20.12.22	273	18	6.753	4·09	276 47	250	315¼	270
Mrs. E. M. Lennie, Tongala	4	4	Jersey ..	Primrose 2nd of Tarnpirr .	7061	18.10.22	273	7	6,026	5·25	316 27	250	360½	212, 356
				Primrose 2nd of Bonshaw ..	7102	25.11.22	273	12	5,388	5 11	275·16	250	313¾	346, 310. 277
				Tulip 4th of Bonshaw ..	7103	29.11.22	273	4	5.420	4 66	252·56	250	288	338, 324, 287
				Tea Rose of Tarnpirr .	10312	19.12 22	273	7	5,327	5·86	312·03	250	355¾	388
Leongatha High School	2	2	Jersey ..	First Choice of Hillcrest .	7034	28.9.22	273	8	8,845	5·66	501 01	250	571½	183, 409, 392, 507, 516, 491,
				Sunset Star of Dunalister .	5927	9.11.22	273	10	7,385	5 04	371·88	250	424	350, 380, 495 469, 442
C. D. Lloyd, Narre Warren	1	Nil	Jersey											
J. G. Lobb, Cardinia	3	3	Ayrshire	Vida of Burnside	9788	4.10.22	213	12	5,320	4·21	223·98	200	255¼	
				Daphne of Quarry Hills ..	9786	14.10.22	273	13	5.900	4·20	252·87	175	288¼	
				Marcia of Holly Green ..	6993	17.11.22	273	12½	5,452	4·16	227·85	175	259¾	

Standard Herd Test—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving	Days in Test.	Milk last Day of Test.	Milk	Average Test	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
H. Luxton, Whittlesea	7	7	Jersey ..	Twylish's Twinkle of Marimba	10323	28 9.22	273	14½	5,499	5·27	289 55	175	330	
				Lily of Ferntree Vale .	9488	14 10 22	273	21	7,510	5 25	393·99	250	449	328
				Dunalister Mannikin Noble Myrtle	10388	18.10.22	273	12	4,623	5 77	266 81	175	304¼	
				Audrey of Somerville ..	5946	20 10 22	273	13½	6,256	5 39	337 34	250	384½	413, 425, 381
				Cloudy of Somerville ..	9414	24.10.22	273	22	7,335	5·41	396 60	250	452	372, 459
				Maid of Linden	7251	30 10.22	273	22	8,061	4 80	386·54	250	440¾	
				Pearl 5th of Holmwood .	6492	13 11 22	273	9½	8,537	4·75	405 63	250	462½	339, 345 378
C. G. Lyon, Heidelberg	9	8	Jersey .	Hawthorn 8th of Banyule ..	9484	30.9.22	273	17½	6.133	5 77	353 80	175	403¼	
				Molly 8th of Banyule ..	9499	9 10 22	273	23	7.978	5.68	452·89	200	516¼	304
				Thora 9th of Banyule ..	9510	31 10 22	169*	19½	4,694	5·01	235 50	200	286½	270
				Audrey Lotus of Banyule ..	9478	4.11.22	273	21	7,713	4 64	358 17	200	408¼	274
				Silvermine 18th of Banyule ..	6080	24 11.22	273	24½	9.211	5 02	462·32	250	527	358, 432 449
				Machree of Banyule ..	9490	26.11 22	273	12½	4,440	6 77	300 40	200	342½	277
				Silvermine 24th of Banyule	11601	12 12 22	273	15½	5,040	5 93	298 92	175	340¾	
				Harp	5206	9 12.22	273	16½	5,532	4 97	274·76	250	313¼	288, 344, **460**, 385, 280
McFarlane Bros., Bundoora	9	9	Ayrshire	Queen Marie of Gleneira ..	11259	26.9 22	273	8½	5,825	4 01	233 40	175	266	
				Queen Mary of Gleneira ..	6151	8 10.22	247	4	6.971	3·90	271 63	250	309½	259, 288
				Marvis of Ayrbrae	9968	9.10 22	273	14	6.419	4 25	272 58	175	310¾	
				Daphne of Ayrbrae ..	5403	21 11 22	273	5	7,720	4 74	365 97	250	417¼	288, 287, 324, 316
				Virtue of Ayrbrae ..	7565	21.11.22	273	11	5.159	4·48	231 36	200	263¾	188
				Heather Belle of Ayrbrae ..	6640	29 11 22	273	9	7.673	4 19	321 57	250	366½	281, 246
				Mulberry of Ayrbrae ..	5405	7 12.22	260	6	7.071	4 11	291·61	250	332½	203, 258, 286
				Lady of Ayrbrae	7562	9 12.22	273	8½	5.498	4·41	242 60	200	276½	188
				Lassie of Ayrbrae .	6641	18 12 22	260	9½	6,475	3 91	253 93	250	289½	242, 235
W. McIvor, Moranding	4	4	Ayrshire	Chance of Golden Vein .	5417	24 10 22	248	4	6.507	4 02	261 66	250	498¼	293
				Edith of Golden Vein ..	5419	1 11 22	240	4	5.953	4·76	283 59	250	323¼	276
				Empress 3rd of Golden Vein	5421	9.11.22	256	4	5,902	4 34	256 17	250	292	
				Foliage of Golden Vein . .	5423	12 11 22	257	9	5,374	4·68	251 37	250	286½	278

* Sold before completion of full term.

STANDARD HERD TEST—*continued.*

Owner	No. completed Test.	No. Certificated	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test	Milk.	Average Test	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
W. J. McKernan, Byrneside	3	3	Ayrshire	Dot of Golden Vein .	2634	22 10 22	273	23	8.437	4 60	388 19	250	442½	347, 464 222, 266
				Star of Kelvin Grove .	6104	10 11.22	251	4	7,356	4 31	317·08	250	361½	
				Countess of Locheden .	10012	7 12 22	273	22	6 929	4·35	301 41	175	343½	
P. J. Maloney, Tongala	4	4	Jersey	Lady of Belgonia	9551	2 10.22	273	6	5,366	5·58	299 38	250	341¼	243, 296
				Marie of Bonshaw	7171	18 11 22	273	5	7,029	4 61	323 80	250	369¾	241, 297, 367
				Beauty of Belgonia ..	9548	29 11 22	273	17	7,231	5 52	399 08	200	455	400
				Tiny Choice of Belgonia ..	11634	6.12 22	273	16½	6,254	6 13	383 54	175	437¼	
W. R. Meredith. Ondit	2	Nil	Ayrshire											
T. Mesley, Dalyston	3	3	Jersey ..	Lily of Rosemont .	11926	6 10.22	273	13	5.152	6 07	312 77	175	356½	
				Pansy of Rosemont .	10343	9 10 22	273	19½	7,709	5·68	438·75	200	500¼	257
				Peggy Pride of Warenda .	11647	19.10.22	273	10	5.650	6·62	374 09	200	426½	298
D. C. Miller, Agnes	5	2	Jersey ..	Princess of Kirkhill.. ..	11648	3.10 22	254	4½	3,774	5·06	190 85	175	217½	
				Daisy 2nd of Ferndale ..	5568	8.10 22	250	4½	4 971	5·36	266·37	200	303¾	198
E. J. Moore, Cowes	1	1	Jersey .	Fairy Bell of Rochdale ..	9793	4.10 22	273	6	4.822	5 05	243·34	200	277½	211
R. G. Morton, Bacchus Marsh	1	Nil	Shorthorn											
W. J. Muhlebach, Batesford	5	4	Ayrshire	Pearline 2nd of Retreat ..	7538	26 9.22	246	5	4.471	4·47	199 86	175	228	
				Lobelia 2nd of Retreat ..	7534	12.10.22	273	10	4,986	4 49	223 53	175	254¾	
				Gertie of Ben Kell	7533	24 10.22	273	8	4.402	4 24	186·72	175	213	
				Beautiful of Retreat ..	5381	27.10.22	269	4	7.833	4 40	345 02	250	393¼	324

Standard Herd Test—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
H. J. Munro, Casterton	2	2	Ayrshire	Elsie of Glencourt .. Daphne of Glencourt	7543 9932	29 9 22 6 12 22	273 273	8½ 8½	8,063 4.200	4 11 4 63	331 44 194 46	250 175	377¾ 221¾	236
C. G. Newton, Kilmany South	2	Nil	Ayrshire											
Mrs. E. O'Donoghue, Kilmore	4	4	Ayrshire	Roseleaf of Hill View Lizzie of Hill View Holly of Hill View .. Rosebud 2nd of Hill View	10095 10092 10091 11295	17.10 22 2 11 22 3 11 22 11 11 22	236 273 273 273	4 14 14 13½	5,320 5.557 4.704 5.274	4 47 3 80 4 44 4 29	237 64 211 36 209 13 226 22	200 175 175 175	271 241 238¼ 258	
J. T. O'Loughlin, Dandenong	2	Nil	Red Poll											
Mrs. Lilian Orchard, Grahamvale	5	3	Jersey ..	Tulip of Jerseyvale .. Rose of Jerseyvale Daffodil of Jerseyvale ..	10360 9590 7220	30.10 22 3.11.22 17.11 22	273 273 273	15½ 9 15	5,332 4,603 4.693	5·17 5 12 5·35	275 46 235 62 251·08	250 200 250	314 264 286¼	260 198 229, 251
T. H. Payne, Kilmore	3	1	Red Poll	Plumstead Pip	220AA	3.10 22	273	7	6.387	4 55	280 66	250	320	322
	1	1	Jersey ..	Woodmore Fairy	10366	26.10 22	273	17½	6.144	6 20	381 23	250	434¾	
H. Perdriau, Werribee	2	1	Ayrshire	Patch of Banyule ..	10143	19 11.22	224	4	5.408	4 68	253 03	250	288½	254
D. Peter, Mornington	3	3	Jersey ..	Dunalister Perries Attractive Dunalister Noble Myrtle .. Dunalister Noble Czarina ..	10410 10406 10403	4 10.22 5 10 22 26.11.22	273 236* 273	9½ 14½ 16½	6,620 6,754 7,951	5·84 5·35 4·72	386·88 361 62 374 88	250 250 250	441 412¼ 427¼	

* Withdrawn through sickness.

STANDARD HERD TEST—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs
								lbs.	lbs.		lbs	lbs.	lbs.	
J. Phillips, Murraydale	1	1	Jersey ..	Carnation of Ferntree Vale ..	9637	24.12 22	273	19½	6.513	5·24	341 37	200	389¼	274
R. Purnell, Moriac	2	2	Jersey .	Lady Grey 18th of St Albans Laurie 2nd of Ferntree Vale.	11515 9556	26.10 22 13.11 22	273 273	10½ 8	4,930 5.478	5 18 5 08	255 37 278 38	175 200	291 317	
R. Ralston, Moglonemby	7	7	Ayrshire	Winnie of Ben Kell.. . Lady Dulcie of Ben Kell . Poppy of Ben Kell . . Brunette of Willowvale . Crissie of Willowvale .. Isla of Ben Kell .. Pardon of Ben Kell ..	6744 5751 4584 6735 6736 6739 5753	25.9 22 26.9.22 27.9 22 27 9 22 6 10 22 17.10.22 18.11 22	273 273 269 269 273 273 255	19½ 4½ 4 4 7½ 13½ 4	8.716 7,409 10.243 5.869 5 631 7,036 7.106	4 34 4 05 4 70 4·19 3 65 4 27 4 01	378 69 300 12 481 06 245 66 205 54 300·43 285 18	200 200 250 200 200 200 250	431¾ 342½ 548½ 280 234¼ 342¼ 325¼	259 356 324, 412, 286 208 210 231. 336
J. D. Read, Springhurst	1	1	Jersey	Gladiolus of Springhurst ..	12216	18.11.22	273	22	5,987	5 70	341 35	175	389¼	
Miss Bruce Reid, Bundoora	5	3	Jersey ..	Jubilee Wattle . Mauve Lilac of Kameruka . Jubilee Azalea Winks .	10460 7349 7338	10.11.22 16.11 22 10 12.22	273 273 273	17 16 15	6.711 5.951 5,877	4 95 5 45 5 99	332 34 324 56 351 88	200 250 250	378¾ 370 291¼	229 342, 292, 276 356, 387
C. L. Rigby, Lower Ferntree Gully	3	1	Ayrshire	Gracie of Netherbrae .	10217	20 11 22	273	9	5.293	3 57	189 03	175	215½	
A. Robertson, Tooradin	2	2	Jersey ..	Gipsy of Hillcrest . . Handsome of Lesterfield ..	7035 10269	7 10 22 11.12.22	273 273	5½ 16½	6.214 5,915	4·37 4·80	271·71 283 80	250 250	309¾ 323½	 223
Miss S. L. Robinson, East Malvern	6	5	Jersey ..	Kyora Anthem .. .. Kyora Needle 3rd .. .. Starbright of Ruhbank .. Needle of Ruhbank.. .. Kyora Velveteen ..	11686 11687 12229 Not yet allotted 10466	8.10.22 11.10.22 19.10.22 19.10.22 17 12 22	273 273 273 273 273	8 8½ 11 8½ 20	3,460 3,292 3,631 3,075 4,499	5·28 6·62 5·28 6·13 5 27	182·66 217·80 191·82 188·59 237 14	175 175 175 175 200	208¼ 248½ 218¾ 215 270¼	 245

STANDARD HERD TEST—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving	Days in Test	Milk last Day of Test	Milk	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs		lbs.	lbs	lbs.	
W. B. Ronald, Pakenham East	3	1	Jersey ..	Dunalister Lady Lydia ..	10376	7.10.22	273	10	5,128	5·31	272 48	200	310¾	
G. Rowe, Kardella	3	2	Jersey ..	Joy of Hillcrest ..	10468	26 11.22	259	4	4,067	5 45	221 59	200	252¾	205
				Sweet Pansy 5th of Melrose ..	7400	16.12.22	273	10½	5,109	6 24	318 64	250	363¼	245, 311, 362
S. Russell, Tongala	4	4	Friesian	Tongala Doris . .	Not yet allotted	18 10.22	261	4	7,460	3 60	268 36	250	301½	
				Dimple of Craigneil..	1070	16.11.22	273	18	9,814	3·62	355·67	200	405½	311
				Mossvale Sweet Nell ..	Not yet allotted	16.11 22	246	4	5,222	3·82	199 42	175	227¼	
				Springfield No 9	1071	30.11.22	273	28½	12,331	3 95	487·11	200	555¼	357
Agricultural High School, Sale	·2	Nil	Ayrshire											
A. H. Schier, Kernot	14	8	Ayrshire	Adella's Pet of Inverleigh ..	5853	10 10.22	273	13½	8,629	3·78	326 49	250	372¼	250, 273,
				Dolly Brown of Inverleigh ..	5854	10 10.22	273	9½	7.261	3 92	284 35	250	324¼	226, 253, 205
				Scotswood Mistress .	10310	23 10 22	273	14½	6 486	4 23	274 22	175	311½	
				Dolores 2nd of Banyule .	10286	28 10.22	273	5½	5,077	4 55	231 08	200	263½	180
				Queen of Scots 2nd of Banyule	10290	9.11.22	257	4	5,851	4 82	282 24	200	321¾	216
				Scotswood Marigold ..	10304	20.11 22	273	17½	7,283	3 69	269 03	175	306¾	
				Gold Point 2nd of Banyule ..	10288	28.11 22	273	12	5,682	4 80	272 97	200	311¼	224
				Scotswood Daphne Brown ..	10294	16.12 22	273	10	4,493	4·20	188 84	175	215¼	
J. Scott, Heidelberg	·1	Nil	Jersey											
O J. Syme, Macedon	9	8	Friesian	Dominion Jessie of Oakview 2nd	1122	1 10.22	273	13½	6,409	3 57	228 87	175	261	
				Coldstream Moss Rose .	1121	7.10.22	273	15	8,032	4 78	383 59	175	437½	
				Colantha Curly Segis ..	1111	24.10.22	257	4	9,960	3·45	343·60	200	391¾	302
				Belle Van Cleve	1113	29.10.22	248	4	7,638	3 66	279·91	200	319	
				Bolobek Diana .. .	342	9.11.22	240*	7½	7,002	3 58	250 90	200	286	231
				Belle Johanna Rue ..	1114	18.11.22	259	4	6.429	3·71	238·89	200	272¼	174
				Duplicate Posch Maud ..	300	19.11.22	273	31	13,699	3·17	434·36	250	495¼	391, 348, 420, 365, 467
				Bolobek Ursula . ..	323	6.12.22	273	18	8,240	3·59	296·20	250	337¾	296

* Sold before completing test

STANDARD HERD TEST—*continued.*

Owner	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs
								lbs.	lbs.		lbs.	lbs.	lbs	
J. R. Telford Estate, Kyabram	4	4	Ayrshire	Trissie of Wethersdane ..	4172	25 9 22	273	12	7,549	4·28	323·37	250	368¾	363
				Adora of Fern Hill .. .	5924	29 9 22	273	20	8,419	4·43	370 69	250	422½	349
				Dolly 4th of Glengowrie ..	5999	7 10 22	273	31	9,672	4 33	428·77	250	489	376
				Countess of Burnside .	5998	12 10 22	273	14½	7.231	4 28	309·35	250	352¾	311
W. Tendeson, Lilydale	1	1	Jersey .	Silvermine of Brookside .	9724	17 11 22	273	11	5,463	5 97	325 87	250	371½	288
J. Thorburn, Woodend	3	Nil	Ayrshire											
T. Trevaskis. Tongala	1	1	Jersey ..	Romany Girl 2nd of Tarnpirr	7062	13 11 22	273	9½	6,918	5 24	362·58	250	413¼	243, 280
J T. Tuckey, Alberton	3	2	Ayrshire	Ideal of Tregorland . ..	10550	27.9 22	263	4	5,284	5 26	278 13	250	317	
				Trinket of Tregorland ..	11468	29 9 22	273	8½	5.089	3·93	200 13	200	228¼	
J. T. Tweddle, Berwick	5	4	Friesian	Jessie Fobes Homestead of Oakview	1079	4.10 22	273	13	7,243	3 88	281·10	200	320½	250
				Ashlynn 52nd	1084	11 10 22	273	24	8,023	3·71	297·45	200	339	263
				St. Alban's Cordyline Hazel ..	649	20 10 22	273	8½	5,030	3 51	186 73	175	213	
				Ashlynn 56 .. .	1086	31 10 22	273	6	5,920	3 91	231 [illegible]	200	263¾	254
G. Vallance, Bacchus Marsh	7	7	Ayrshire	Ruby of Banyule . ..	6792	25.9 22	273	12	8.178	4 23	346 21	250	394¾	247
				Dot 3rd of Belwell .. .	11482	5 10 22	273	13½	7,552	3·61	262 75	250	299½	274
				Rose of Lake Valley	11486	27 10.22	273	14	6.845	3 75	256 40	200	292¼	
				Ettie of Banyule .. .	5778	29 10.22	273	14	8,504	4·49	381·49	250	435	332
				Joan of La Motte .. .	5257	26.10 22	262*	16	7,830	3 93	307·43	250	350½	412, 264, 220
				Aspasia of Banyule .	5761	9 12 22	263*	19½	9,541	3·86	368 18	250	419¾	382
				Pretty of Belwell	11485	24 12.22	248*	13½	6,331	4 26	269·73	250	307½	241

* Herd withdrawn before test was completed

STANDARD HERD TEST—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving	Days in Test	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs	lbs.		lbs.	lbs.	lbs.	
R. Viet, Trentham	1	1	Jersey ..	Fuchsia 2nd of St Albans ..	12035	1.11 22	273	14½	4,485	5 29	237 03	175	270¼	
A. L. N. Walter, Little River	3	3	Jersey ..	Daisy 2nd of Ferntree Vale .	9398	15.10.22	273	16½	6,213	5 39	335·11	200	382	249
				Postcard of Tarnpirr .	5167	22 10.22	273	8½	4,597	6 55	301·01	250	343¼	338, 342, 364
				Flower of Paradise	11737	17 12.22	273	15	4,086	5·83	238 10	175	271½	
Agricultural High School, Warragul	2	2	Red Poll	Wyreema	283A	10 11 22	273	12	4,986	4·32	215·16	175	245¼	
				Gipps Wendy . ..	861B	20.11 22	250	4	4,080	4 01	199·93	175	228	
H. L. Webb, Sunbury	5	4	Ayrshire	Lily's Queen of Holly Green ..	11495	7.10 22	247	4	5,978	4·21	251 66	175	287	
				Empress of Holly Green ..	6042	7.11.22	273	13½	7,625	4 46	340 04	250	387¾	263
				Milkmaid of Holly Green ..	6045	20.11 22	273	27½	8,232	4 12	339·05	250	386½	190, 297
				Rosebloom of Holly Green ..	6957	23 12 22	273	16	7,634	3·94	300 77	175	342¾	
J. F. Williams, Yinnar	1	1	Friesian	Carlyle Lady . .	1137	18.10.22	273	19½	8,084	3·30	266 81	175	304¼	
J. Wills, Bacchus Marsh	1	1	Friesian	Jennie of Lerderderg .	..	7 10.22	273	27	7,580	3 65	276 94	175	315¾	
W Woodmason, Murrumbeena	6	6	Jersey .	Lady Elector 3rd of Melrose	5549	25.9.22	273	18	7,552	5·63	425 08	250	484½	268, 337, 404 408, 446
				Lassie Fowler 4th of Melrose	4522	23 10 22	273	14	7,696	5 54	426 03	250	485¾	340, 426, 47 472, 433
				Graceful Duchess 17th of Melrose	9879	29.10.22	273	11½	6,116	6 03	388·17	250	442½	333, 363
				Jessie 15th of Melrose ..	5546	1 11.22	273	15½	6,571	6·16	404 74	250	461½	270, 326, 351 361, 356, 34
				Lassie Fowler 10th of Melrose	11780	16.11 22	273	14½	4,602	5 89	270 94	175	308¾	
				Graceful Ducesss 25th of Melrose	11778	6.12 22	273	15	4,420	5·43	240 15	175	273¾	

WEEDS AND THEIR ERADICATION.

(Continued from page 512.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Cape Broom, *Cytisus canariensis.* Steudel. Family: *Leguminosæ.*

This plant is a native of the Canary Islands, as its botanical name implies, and is yet another of the useless importations from which this country suffers.

The plant itself (Figure 69) is too well known, with its erect stems, yellow flowers, and soft hairy leaves to need any description. It is a proclaimed plant under the Vermin and Noxious Weeds Act in fourteen shires.

Cape Broom often grows to a height of several feet. It should be dug out, piled and burnt before its seeds are ripened. On arable land seedlings are easily destroyed by cultivation, but where ploughing cannot be practised the young plants can be destroyed by means of an arsenical spray. This useless scrub soon becomes a serious pest when neglected, often taking possession of roads little used by vehicular traffic.

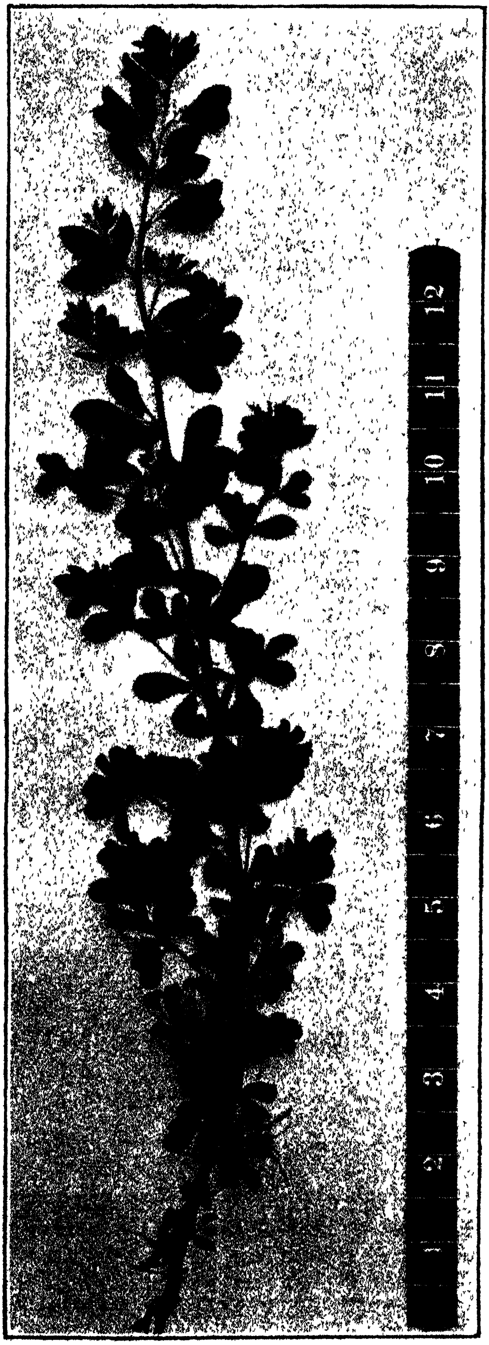
In addition to its uselessness for fodder, and the cover it affords to rabbits, its foliage is reputed, in common with some others of its genus, to be slightly poisonous.

One of the most serious charges against it, however, is that it may become a serious trouble to the orchardist, inasmuch as it frequently acts as a host plant for the apple-bark mussel scale, *Mytilaspis pomorum*. This and other of the family *Coccidæ* are proclaimed insects under the Vine and Vegetation Diseases Act, and it can easily be seen what a menace to the fruit-growing industry a neglected area of Cape Broom may become. The writer has seen Cape Broom stems badly infested with this scale, so that it is not surprising that many a fruit-grower wonders where his supply of scale insects keeps coming from in spite of all his diligence with the spray pump in his orchard.

When the young of this scale hatches out during the spring months, the dust-like, but active young scale insects will attach themselves to the legs of birds and flies or other insects, or may be borne away by winds, and by these agencies become transported to apple trees.

The number of scale insects that may hatch out on a single plant is almost incredible, but it is a law of nature that where mortality is great, reproduction must also be great. This species of scale has a fixed existence once it commences to feed, and here another rule applies. An animal having a fixed existence when mature has a free moving, swimming, or flying existence when young, and this scale, on its emergence from the egg, is an active running insect, and thus is enabled to avail itself of the aid of birds, insects, or wind to become transported to other plants, some of which may be situated long distances from where the scale insect was hatched.

It can therefore be easily seen that Cape Broom, in addition to being a pest to the land-owner, is likely to become a tax to the apple-grower, in fact, to the fruit industry in general, as, in addition to the apple-bark



Cape Broom (*Cytisus canariensis*) Blossom.
(Photographed first week in November.)

scale, Cape Broom is occasionally the host plant of olive scale, *Lecanium oleæ*, an enemy of the citrus fruit grower. The latter scale excretes a kind of honey-dew, which is then attacked by *Capnodium citri*, a fungus This, besides lessening the value of the fruit, lowers the vitality of the which gives to the trees the dirty sooty appearance too frequently seen. tree by preventing the proper functioning of its leaves.

To be continued.

POULTRY NOTES FROM WERRIBEE.

By W. O. Pederick, Poultry Foreman.

So that the young birds may have room to grow and develop, culling of both young and old stock is now being carried out.

Pullets hatched in July and August are now coming in to lay. Every effort is made to prevent pullets laying too early. No meat is fed them, and they are given as much liberty as possible.

Cockerels intended for stud birds are on free range, where they can obtain plenty of insects, seed, and natural food. In addition, they are liberally fed on wet mash in the morning and given plenty of grain at night.

Plentiful supplies of clean cool drinking water are available, and ample shade is provided to protect the birds from the sun. During the warm weather special attention is paid to the ventilation of the houses, and the dust baths are moistened on the hot days.

The laying hens are being fed liberal quantities of green stuff in the morning mash, and it has been found profitable to also feed chaffed green stuff after the evening feed of grain.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

As a preventive against codlin moth, apple and pear trees should be sprayed with arsenate of lead whenever there is danger from the prevalence of the moth. One of the secrets of success in codlin moth spraying is the destruction of as many as possible of the insects of the first brood. Thus, if particular care is given to the early sprayings, keeping the fruit covered with spray for a month or six weeks after setting, this result is easily accomplished. Some growers prefer to gather all fruit infected by the first brood, spraying only for the second and later broods. Even if all the fruits attacked are gathered, which very rarely happens, the grower suffers from the loss of fruit, which he can ill afford, unless his crop be a heavy one.

Another feature for consideration is the fact that the presence of any arsenical spray on the foliage is responsible for the destruction of the pear and cherry slug, root-borer beetle, and all forms of leaf-eating insects.

Spraying the cherries for the slug will now be necessary. Arsenate of lead may be used, provided the fruit is not far advanced. Hellebore, and also tobacco water, are effective against this pest.

CULTIVATION.

All orchard soils should be kept well worked during the summer months. It is very essential that the trees should have an abundant supply of moisture during the whole of the growing season. This will mean an increased supply of fruit buds for the next season, consequently the frequent summer cultivation of the soil will be a necessity if the health and vigour of the trees are to be maintained.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture, and are not able to obtain or retain sufficient for their nourishment; they then very soon wither and die. The soil around these should always be kept well stirred; they may also be given a good straw or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to maintain a good loose earth mulch during the whole season, and to keep down all weeds and useless orchard growths.

PRUNING.

Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree and to increase the development of new fruit buds.

The Vegetable Garden.

Tomatoes will require much attention at this time of the year. If the plants have been well looked after, they should be making vigorous growth. It will be to advantage to tie the plants to stakes, training them to two or three main growths, and pinching out all laterals as they come.

The plants should be well watered, and occasionally a handful of bonedust and blood manure mixed should be forked in around the roots. Where stable manure is used, it should be used as a mulch, forking it in every three or four weeks, and making a fresh mulch.

It is now recommended that occasional doses of sulphate of potash as a manure for tomatoes will help the plants to resist the spotted wilt.

All plants of the cucumber and melon family should now be constantly supplied with ample water. Pinch out unnecessary lateral growths, and also the terminals.

The following seeds may now be sown:—French beans, cabbage and cauliflower for winter crops, parsnip, lettuce, and celery.

The side shoots of celery plants should be removed, afterwards earthing up the plants. Asparagus beds should be top-dressed, and allowed to grow without any more cutting. The vegetable beds will need frequent forking and hoeing to keep the soil sweet, and to keep down all weeds.

The Flower Garden.

Plant out dahlias this month; green plants early, and plants grown from tubers later in the month. Water well at planting, and keep well cultivated afterwards.

Rose bushes and beds may be given a good mulch with light stable manure, straw, grass, or lawn clippings. The beds should be kept rather dry, so as to allow the plants to rest before the autumn period of growth.

Sow seeds of cosmos, asters, zinnia, balsams, cockscomb, and other late summer and autumn blooming annuals.

Cut down delphiniums that have yielded their first crop of flowers, so as to allow a succession of flowers to come.

Daffodil, hyacinth, tulip, ranunculus, anemone, and other bulbs and tubers may be taken up and stored; while gladioli corms may still be planted.

The garden must be kept well watered and cultivated, so as to tide the plants over the hot and dry season.

REMINDERS FOR JANUARY.

LIVE STOCK.

HORSES.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares* should be well fed on succulent food if available; otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide succulent fodder and plenty of clean water and shade. Provide "lick" in trough, consisting of salt 20 lbs., lime 20 lbs., superphosphate 5 lb., and sulphate of iron 1 lb. Limewash the cow bails, it helps to keep down flies. Provide calves. if possible, with good grass run, or lucerne hay or oats in a trough. Now that the Dairy Produce Act is in operation it is necessary to take proper care of milk and cream, as it must be paid for according to its quality. Utensils must be kept clean and well tinned. Cream must be cooled and kept cool and delivered fresh to the factory. Write to the Department of Agriculture for "Hints to Dairymen."

Pigs.—Supply short bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal or superphosphate per 100 lbs. live weight in food daily. If pigs are lousy, dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Plenty of water should be available for them to wallow in in hot weather.

The automatic feeder described and illustrated in Bulletin 16 is proving a great success.

Sheep.—The various breeds of ewes come in season approximately during the following months:—Merinoes and comebacks, November and December; Crossbreds, January and February; Pure British breeds, February and March. Be sure of ample rams running with them. Join best rams first. Clean up with those not quite so good. Use only rams with width and substance, and never inferior-fleeced ones. Rams during summer are rarely to be seen working in the day time. It is not always necessary to yard the ewes. Breed from only good-fleeced, roomy, sound-mouthed ewes. Keep in view wool production as well as a shapely, good forequartered export carcass Lamb, mutton, and fine to medium grade wool will be amongst the foremost commodities for some time to come. Two-tooth ewes, if well grown, can be bred from, "if they're big enough they're old enough," but they must be well treated throughout. Purgative drenches, worm pills, &c., should be given to any ewes hollow and off their feed, lambs scouring, or grown sheep showing unhealthy discharge, as the cases may be. In persistent instances, the second and third doses. Healthy sheep are rarely fly-blown.

Poultry.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green food; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily.

BEE-KEEPING.

January being usually the hottest month of the year, combs may melt down on very hot days in hives made out of cases unless they are in some way shaded during the hottest part of the day. If bags are used, they should be removed again as soon as the hot weather is over, because they afford hiding places for bee moths, spiders, and other enemies of bees.

With factory-made or other hives, the walls, cover, and floor of which are of timber not less than ⅞ inch in thickness, there is no need to provide artificial shade, provided the entrance is of sufficient width and the hive of ample capacity to accommodate the bees. The ordinary entrance, which is 5-16 inch deep and the width of the hive, is generally sufficient. It may, however, be enlarged by raising the hive another ¼ inch or so in front should there be much clustering out of the bees.

Top ventilation should not be given; it is not necessary, and the bees dislike it. Bees control the temperature inside the hive by fanning at the entrance and by moistening the combs with water.

During this and the next month bees generally supersede queens in their third year, or which are failing during the second. Queens are sometimes still quite prolific, but by some means the bees know that they would not live through the coming winter, and that it is necessary to raise a successor while drones are still flying, so that the young queen may not remain unfertilized. The queen-cells, which bees construct when superseding, are few—one or two, rarely more. They are generally built on the face of one of the outer combs, often one containing no other brood—not on the edge of a brood comb, as in the case of swarm cells.

Supersedure queen cells must not be mistaken for swarm cells and destroyed, otherwise the hive may eventually become queenless.

All colonies should be examined to see that each has a laying queen. It sometimes happens that the virgin queen of a swarmed stock is lost on her mating flight, and as there is then no young brood in the hive from which to raise another queen, the colony becomes hopelessly queenless. Therefore, whenever neither young brood nor eggs are seen in a hive, a comb of young brood or eggs from some other colony should be given to the bees. If, on examination a few days later, queen-cells have not been raised, then there is a virgin queen in the hive which may be expected to commence laying within a fortnight at the outside.

CULTIVATION.

Farm.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

Orchard.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

Vegetable Garden.—Plant out all seedlings, when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabi, &c.

Flower Garden.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

Vineyard.—Summer bud or *Yema* grafting may be practised in January, though February is the usual month. (See Bulletin No. 35, obtainable on application.) This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain, sulphuring in case of odium, or spraying for downy mildew, that must be carried out. Should heavy rain fall it will be necessary to repeat spraying in order to insure adequate protection The final spraying, to protect foliage, and thus permit fruit to ripen, should be applied in January; the exact date will depend on the weather. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention. Make it a rule to spray immediately *before* watering.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

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